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Loneliness among older adults in the community during COVID-19

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Abstract

Objective: Physical distancing and stay-at-home measures implemented to slow transmission of novel coronavirus disease (COVID-19) may intensify feelings of loneliness in older adults, especially those living alone. Our aim was to characterize the extent of loneliness in a sample of older adults living in the community and assess characteristics associated with loneliness.

Design: Online cross-sectional survey between May 6 and May 19, 2020

Setting: Ontario, Canada

Participants: Convenience sample of the members of a national retired educators' organization.

Primary outcome measures: Self-reported loneliness, including differences between women and men.

Results: 4879 respondents (71.0% women; 67.4% 65-79 years) reported that in the preceding week, 43.1% felt lonely at least some of the time, including 8.3% that felt lonely always or often. Women had increased odds of loneliness compared to men, whether living alone (adjusted Odds Ratio (aOR) 1.52 [95% Confidence Interval (CI) 1.13-2.04]) or with others (2.44 [95% CI 2.04-2.92]). Increasing age group decreased the odds of loneliness (aOR 0.69 [95% CI 0.59-0.81] 65-79 years and 0.50 [95% CI 0.39-0.65] 80+ years compared to <65 years). Living alone was associated with loneliness, with a greater association in men (aOR 4.26 [95% CI 3.15-5.76]) than women (aOR 2.65 [95% CI 2.26-3.11]). Other factors associated with loneliness included: fair or poor health (aOR 1.93 [95% CI 1.54-2.41]), being a caregiver (aOR 1.18 [95% CI 1.02-1.37]), receiving care (aOR 1.47 [95% CI 1.19-1.81]), high concern for the pandemic (aOR 1.55 [95% CI 1.31-1.84]), not experiencing positive effects of pandemic distancing measures (aOR 1.94 [95% CI 1.62-2.32]), and changes to daily routine (aOR 2.81 [95% CI 1.96-4.03]).

Conclusions: While many older adults reported feeling lonely during COVID-19, several characteristics – such as being female and living alone – increased the odds of loneliness. These characteristics may help identify priorities for targeting interventions to reduce loneliness.

Strengths and limitations of this study

- This survey study leveraged a strong community-based partnership to obtain timely data from a large sample of older Canadians on the impacts of COVID-19.
- This study identified several characteristics that increased the odds of loneliness, which may help to identify priorities for targeted interventions to reduce loneliness.
- The data were based on a convenience sample of retired, educational staff, who are not fully representative of the Canadian population. The perspectives of vulnerable groups who may be at greater risk for loneliness (e.g. those with severe mental health illness, low income, no home internet access, etc.) are likely underrepresented in this sample.

Background

As data emerge on how common, yet harmful, it is to be lonely, loneliness is increasingly recognized as a public health priority. In the United States, more than 40% of respondents to the nationally representative Health and Retirement Study reported feeling lonely.[1] In Canada, 1 in 4 older women and 1 in 5 older men report feeling lonely at least some of the time.[2] Older adults are particularly susceptible to loneliness because of aging-related events (e.g. retirement, declining health, widowhood). Women report higher rates of loneliness than men,[2,3] possibly due to their longer life expectancy and greater likelihood of outliving their spouse, resulting in prolonged widowhood,[4,5] their caregiver roles,[2,6,7] lower incomes[8], and their greater tendency to acknowledge feeling lonely.[5] Addressing loneliness is important because of its profound impact on health and well-being, including increased risk for premature death,[9,10] cardiovascular disease, depression, dementia and even suicide.[11-17]

The novel coronavirus pandemic (COVID-19) and accompanying physical distancing and stay-at-home measures (i.e. closure of nonessential businesses and public spaces, as well as recommendations to practice physical distancing with anyone outside the home) are expected to intensify feelings of loneliness. Previous infectious disease outbreaks and pandemics have demonstrated increases in loneliness, anxiety, and depression from quarantine-induced social isolation.[18,19]

Understanding how older adults have been impacted by COVID-19 is vital to address their needs promptly and effectively and prevent unnecessary harms as the pandemic persists. Early cross-sectional studies have examined public concerns regarding COVID-19 (e.g. becoming infected, reduced health care access) and its impact on daily life.[20,21] While valuable, these studies were conducted prior to or on the cusp of the implementation of physical distancing and stay-at-home measures, did not report on mental health, under-represented older adults[20], a key high-risk group, and did not explore important

differences between women and men. McGinty et al recently published prevalence estimates of psychological distress and loneliness in the US; although, subgroup analyses focused on psychological distress rather than loneliness.[22] Timely data are needed that are relevant to older women and men to inform public health responses and healthcare delivery.

We conducted an online cross-sectional survey to assess how the COVID-19 pandemic has affected older adults living in the community in Canada. Our objective was to characterize the extent of loneliness in older adults, including differences between women and men, and examine factors associated with loneliness to identify groups likely to benefit most from intervention.

Methods

Study design and setting

A closed, online cross-sectional survey was administered to members of the RTOERO (formerly known as the Retired Teachers of Ontario) between May 6 and May 19, 2020. At this time in Ontario, Canada, physical distancing measures had been in place for about seven weeks; daily case and death counts were in decline after peaks in late April; and outbreaks in long-term care homes were a focus of news headlines (**Figure 1** for timeline).

RTOERO is a voluntary membership organization of more than 81,000 retired educators, administrators, and educational support staff, from child care, K-12 and post-secondary settings, that provides group health insurance benefits, as well as other programs and services, to the broader education community (https://www.rtoero.ca). Members were invited to participate by e-mail from RTOERO's chief executive officer. Two reminder emails were sent at 7 and 10 days. The survey was not publicly advertised. All members were eligible to participate if they had a registered e-mail address (~62,000). Study materials

were provided in English and French. Our study design and reporting followed the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).[23]

The Research Ethics Board at Women's College Hospital in Toronto, Canada approved this study [#2020-0051-E]. A link to a study information sheet was provided on the survey's home page and informed consent was obtained electronically. Participation was voluntary, and no incentives were provided. Minimal identifying personal information was collected (e.g. first three digits of postal code).

Questionnaire

The questionnaire was developed with RTOERO leadership and included 32 questions (**eAppendix** in the **Supplement**). Several questions were adapted with permission from the *Stanford Coronavirus Survey* (https://pcrt.stanford.edu/covid). Questions examined the impact of COVID-19 on daily life; loneliness; and the use of digital technologies for social connectivity. We used a single-item, direct measure of loneliness by asking respondents how often they felt lonely in the past week (1-2 days, several days, most days, every day), consistent with the *Canadian Longitudinal Study on Aging* (CLSA)[2] and the UK's *Community Life Survey*.[24] We chose this approach because it allowed respondents to self-report on loneliness and was considered more suitable for the pandemic context, where asking indirectly about feeling "left out" to infer loneliness may be less relevant as distancing and stay-at-home measures were universally applied.

Respondents were also asked about their history of COVID-19 symptoms and testing, the extent to which they were practising physical distancing and stay-at-home measures, and sociodemographic characteristics (i.e. age, sex, ethnicity, language, health status and location of residence). The ethnic response categories we used mirrored those used in Canada's national health survey.[25] The questionnaire was pretested in English with 18 RTOERO board members and staff, and in French by 1

staff member, for usability, technical functionality, clarity, flow, sensitive questions, and timing. Pretest results were not included in the final analysis.

Patient and public involvement

As noted above, RTOERO leadership (which comprise members of RTOERO) were involved in all aspects of the study, including questionnaire development, pretesting, and participant recruitment. Preliminary results were shared with the team and feedback was incorporated into the final analysis and manuscript. RTOERO's chief executive officer is a coauthor (JG) and critically reviewed the manuscript. Results will be shared with RTOERO members through a webinar in the fall of 2020.

Data collection

The questionnaire was administered using SimpleSurvey™. Data were stored in an encrypted, password protected form on the secure Simple Survey server and were downloaded to the secure, password-protected Women's College Hospital server accessible to authorized team members. All questions were optional, so completeness checks were not performed; although, respondents were reminded of unanswered questions before proceeding to the next section to minimize incomplete data. We used adaptive questioning to reduce the complexity of questions.[23,26] Respondents were able to save their responses and return to the survey later to complete it. The survey completion rate was the number of respondents who finished the survey divided by the number consenting to participate.[23] Surveys were only analysed if the respondent clicked "Submit" and responded to more than one question.

Exposures

Sociodemographic characteristics - sex, age, living alone, ethnicity, rural residence, health status, and caregiver status – were collected, based on factors previously reported to be associated with loneliness.[3,4] We additionally collected self-reported measures of social support – communication

frequency, receiving offers of assistance and social media use – as well as attitudes and behaviours towards COVID-19 hypothesized to contribute to loneliness, including level of concern, change in daily routine, extent of physical distancing, and perceived positive effects of distancing measures. Variable definitions are presented in the **eMethods** in the **Supplement**.

Outcome

Respondents were classified as lonely if they reported feeling lonely on 1 or more days in the preceding 7 days.[2,24]

Analysis

Chi-squared tests were used to identify sex differences. To identify predictors of loneliness for older women and men, exploratory analyses using sex-stratified and sex-pooled multivariable logistic regression models were conducted. We hypothesized that loneliness would be common, particularly in women and those living alone, and that higher pandemic concern would increase loneliness. In the sex-stratified regression analysis, we calculated unadjusted and minimally adjusted (age and health status) models. In the sex-pooled model, we additionally adjusted for all covariates and formally tested for sex interactions with explanatory factors, including age group, living alone, communication frequency, receiving offers of assistance, change in daily routine, and perceived positive effects of distancing measures, identified in the stratified analysis using interaction terms. Statistical tests were two sided, with $P < .05$ interpreted as statistically significant. Analyses were performed using SAS version 9.4.

Results

Overall, 5556 RTOERO members responded to the survey, of which 5509 provided consent. 4891 surveys were submitted, for a completion rate of 88.8%. We excluded 12 respondents who responded to ≤1 survey question, leaving 4879respondents included in the analysis.

Characteristics

Most respondents were women (3421/4818 [71.0%]), between the ages of 65-79 years (3279/4863 [67.4%]) and completed the survey in English (97.6%) (**Table 1**). They were similar to the broader RTOERO membership in terms of sex (67% female), age distribution (14.5% <65 years; 64% 65-79 years; 21.5% ≥80 years) and preferred language (95% English) (personal communication, J. Grieve). One third of female respondents lived alone (1138/3356 [33.9%]) compared to one fifth of men (266/1351[19.7%]). Respondents were predominantly white (4454/4861 [91.6%]) and in good self-reported health (4370/4873 [89.7%]).

Less than 5% (236/4790 [4.9%]) reported a cold or flu-like illness in the preceding month. Overall, 8 of 4861 respondents tested positive for COVID-19 (0.2%). Most respondents strongly agreed that the COVID-19 pandemic had changed their daily routine (67.5% females vs. 63.2% males, P=0.0047). Additional data on the impact of COVID-19 are reported in e**Table 1** and **eFigure 1** of the **Supplement**.

Loneliness during COVID-19

Overall, 43.1% of respondents felt lonely at least some of the time, including 8.3% that felt lonely always or often (**Table 2**). Women were more likely to report feeling lonely than males (P<0.001). Strategies to avoid feeling lonely included connecting with a friend or family member (82.1% women vs. 70.7% men, P<0.001) and getting fresh air (65.3% vs. 61.9%, P=0.025). Seven percent (7.1%) described other strategies, such as reading, housework and/or gardening, and practising their faith. Most participants frequently spoke with a friend, family member or neighbour, although, a small proportion (0.4%) had no connection at all. Many used social networking websites (87.3% females vs. 78.2% males, P<0.001).

Sex-stratified model

Most factors associated with loneliness were shared amongst women and men (**Table 3**). Older age significantly reduced the odds of loneliness in both sexes after adjustment for self-reported health status. Living alone was associated with loneliness in both women and men; although, the association was greater in men (adjusted Odds Ratio (aOR) 3.86 [95% Confidence Interval (CI) 2.88-5.18] vs. aOR 2.50 [95% CI 2.14-2.92]). Self-reported poor health and higher concern for the pandemic were also associated with loneliness, as were experiencing change to a daily routine, and not experiencing any positive effects or 'silver linings' of pandemic distancing measures; effect sizes varied by sex. Among women, receiving offers of assistance (aOR 0.79 [95% CI 0.69-0.91]) and communicating more often with a friend, family member or neighbour (aOR 0.47 [95% CI 0.34-0.66]) reduced the odds of loneliness.

Sex-pooled model

Women had increased odds of loneliness compared to men, irrespective of living arrangement (aOR 1.52 [95% CI 1.13-2.04] living alone; aOR 2.44 [95%CI 2.04-2.92] living with others) (**Table 4**). Increasing age group was associated with decreasing odds of loneliness. The association of living alone with loneliness was significantly greater for men than women (aOR 4.26 [95% CI 3.15-5.76] vs. 2.65 [95% CI 2.26-3.11], P=0.006 for interaction term). Additional characteristics associated with loneliness included: self-reported fair/poor health (aOR 1.93 [95% CI 1.54-2.41]), being a caregiver (aOR 1.18 [95% CI 1.02-1.37]) and receiving care from a caregiver (aOR 1.47 [95% CI 1.19-1.81]). Pandemic-related factors associated with an increased odds of loneliness included having a high concern for the pandemic (aOR 1.55 [95% CI 1.31-1.84]), not experiencing any positive effects or 'silver linings' of pandemic distancing measures (aOR 1.94 [95% CI 1.62-2.32]) and experiencing change to a daily routine (aOR 2.81 [95% CI 1.96-4.03]). Non-white ethnicity (aOR 0.71 [95% CI 0.54-0.94]), high frequency of communication (aOR 0.55 [95% CI 0.43-0.72]) and receiving offers of assistance (aOR 0.79 [95% CI 0.69-0.90]) reduced the

odds of loneliness. None of the other sex-based interactions we explored with explanatory factors were significant.

Discussion

In a survey of 4879 older women and men, we found that loneliness was common during the COVID-19 pandemic, with more than one-third (34.8%) of respondents reporting feeling lonely sometimes and 8.3% feeling lonely always or often. More women reported feeling lonely than men and had higher odds of loneliness, despite controlling for factors hypothesized to contribute to sex differences including living alone, health status, and caregiving. Our findings are similar to reports from the UK, where 22.4% and 4.1% of older adults reported feeling lonely sometimes or often, respectively, in the first four weeks of lockdown[27], and from the US, where 13.8% (95% CI 11.4%-16.6%) of adults aged ≥18 years reported feeling lonely always or often at the beginning of April 2020.[22]

Living alone is as an important risk factor for loneliness, both pre-COVID-19[4,28,29] and presently.[27,30,31] We found that living alone predicted loneliness in women and men, although the effect was greater in men. Physical distancing and stay-at-home measures are anticipated to have a greater toll for those living alone as they severely limit opportunities for face-to-face interaction to combat loneliness.[30] The effect of living alone on loneliness may be greater in men because they tend to have fewer social contacts and close friends than women.[32-34] Indeed, male respondents in our survey communicated less frequently with family, friends, and neighbours, and were less likely to seek out social connection to mitigate loneliness. Having a smaller social network may exacerbate some of the negative effects of living alone. Emerson recently found that older US adults who lived alone were less likely to have a close relationship that provided emotional security and well-being, and more likely to become 'more lonely' following the onset of COVID-19than those living with others (42.4% vs. 27.9%).[31] Alternatively, our finding may be

due to the inherent overlap in the constructs of 'living alone' and 'marital status' because we partially captured the impact of being widowed or unmarried in men versus women. Prior research has shown that being single has a greater impact on men's loneliness, possibly explained by the fact that for many older men, their partners are their main confidante and source of intimacy.[35,36]

We found that older adults' perceptions and pandemic experiences were also associated with loneliness. Respondents who had a high level of concern for COVID-19, experienced changes to their daily routine, and reported no perceived positive effects or 'silver livings' from the pandemic had increased odds of loneliness, while receiving offers of support and frequently communicating with family, friends and neighbours were protective. These findings underscore the importance of public health messages from the World Health Organization targeted at older adults, including maintaining regular routines or creating new ones that include exercise, regular cleaning/chores, and enjoyable activities; keeping in regular contact with loved ones; and restricting news consumption to specific times of day from reputable sources to reduce undue anxiety or distress.[37]

Family physician visits have been suggested as an important opportunity to screen for loneliness during COVID-19.[38,39] Particular attention is recommended to be paid to patients who are older, live alone or have pre-existing health conditions.[38] Our findings suggest that considering the patient's sex, if they have sufficient social support, and how the pandemic is affecting their daily routines could further assist in identifying at-risk individuals. Such questions would also be beneficial to align patients more purposefully with interventions. Virtual consultations and social prescribing (i.e. linking patients with nonclinical supports in their community such as outdoor exercise classes, walking groups, virtual bereavement programs, etc) may be effective strategies to reduce loneliness during COVID-19 and beyond.[38,40,41]

Lastly, digital technologies and platforms can facilitate social connection;[40,42] although, recent research shows that many older adults lack access to internet-enabled devices[43], and are unready for comparable technologies (i.e. video telemedicine visits) due to inexperience with technology or physical disability.[44] Consistent with prior research[31,45] and likely a function of electronic survey administration, we found high levels (~85%) of social media engagement, with no increased risk for loneliness. Our findings suggest there is a large segment of the older adult population for whom digital media-based interventions may be effective for mitigating and alleviating loneliness. Services that teach older adults how to use and connect with family and friends through social media platforms may be valuable.[46] The importance of offline connection, however, should not be forgotten – phoning parents or older neighbours, and extending offers of assistance can go a long way to making someone feel connected and visible.[47]

A recent US study reported that 30.9% of older adults surveyed felt more lonely after COVID-19 related physical distancing was implemented.[31] Our estimates of loneliness were almost double that of the CLSA's collected between 2010-2015 using a similar age group and measurement approach (49.3% of women and 27.1% men aged 65-79 years felt lonely some of the time vs. 24.7% and 17.9%, respectively, for adults aged 65-74 years).[2,48] Comparisons should, be made cautiously considering differences in study populations. Longitudinal studies provide the most robust evidence of temporal changes. Using data collected at three time points, Luchetti et al found that older adults were the only group studied that showed a slight increase in loneliness in late March 2020 after social distancing measures were implemented in the US compared to the baseline assessment in January/February, although levels remained stable in April.[30] The study found that this increase was driven primarily by unavailable social connections, rather than feelings of isolation. It will continue to be important to consistently measure how rates of loneliness change over the course of the pandemic to identify drivers and determine at-risk populations who could benefit from additional support.

Limitations

Our study leveraged a strong community-based partnership to obtain timely data from a large sample of older Canadians on the impacts of COVID-19. Analyses were exploratory and intended to identify characteristics and circumstances associated with loneliness to help target supports to those who could benefit from them. A limitation is that the data are based on a convenience sample of retired, educational staff, who are not fully representative of the Canadian population. The perspectives of vulnerable groups who may be at greater risk for loneliness (e.g. those with severe mental health illness, low income, no home internet access, etc.) are likely underrepresented in this sample. As such, our findings may be a conservative estimate of loneliness.

Conclusions

While many older adults reported feeling lonely during COVID-19, several characteristics – in particular being female and living alone – increased the odds of loneliness. These characteristics may help guide targeting interventions to reduce loneliness as the pandemic persists.

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Author Contributions

Study concept and design: Savage, Rochon

Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: Savage

Statistical analysis: Wu

Critical revision of the manuscript for important intellectual content: All authors.

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Study funders/sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; nor the decision to submit the manuscript for publication.

Competing interests

None declared

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Table 1. Sociodemographic characteristics of older female and male survey respondents.

Characteristics	**All (N=4,879)[a]**	**Women (n=3,421)**	**Men (n=1,397)**
Language of Survey			
English	4762 (97.6%)	3339 (97.6%)	1365 (97.7%)
French	117 (2.4%)	82 (2.4%)	32 (2.3%)
Age, years	n=4,863	n=3,416	n=1,395
<65	1027 (21.1%)	846 (24.8%)	174 (12.5%)
65-79	3279 (67.4%)	2295 (67.2%)	945 (67.7%)
80+	557 (11.5%)	275 (8.1%)	276 (19.8%)
Living arrangement	n=4,762	n=3,356	n=1,351
Lives alone	1415 (29.7%)	1138 (33.9%)	266 (19.7%)
Access to private outdoor space	n=4,854	n=3,407	n=1,391
Yes	4706 (97.0%)	3302 (96.9%)	1350 (97.1%)
Ethnicity	n=4,861	n=3,410	n=1,397
White/Caucasian	4454 (91.6%)	3153 (92.5%)	1264 (90.5%)
Black/African Canadian	19 (0.4%)	15 (0.4%)	≤5
Chinese	19 (0.4%)	14 (0.4%)	≤5
Indigenous	11 (0.2%)	7 (0.2%)	≤5
South Asian (Indian, Sri Lankan, etc.)	17 (0.3%)	7 (0.2%)	9 (0.6%)
Southeast Asian (Japanese, Vietnamese, Korean, Cambodian, etc.)	14 (0.3%)	11 (0.3%)	≤5
West Asian (Arabian, Egyptian, Iranian, Afghan, etc.)	10 (0.2%)	7 (0.2%)	≤5
Other/Prefer to not say or self-identify	317 (6.5%)	196 (5.7%)	106 (7.6%)
Language spoken most often at home	n=4,855	n=3,411	n=1,388
English	4627 (95.3%)	3251 (95.3%)	1327 (95.6%)
French	165 (3.4%)	120 (3.5%)	41 (3.0%)
Other	63 (1.3%)	40 (1.2%)	20 (1.4%)
Self-reported health status	n=4,873	n=3,417	n=1,397
Excellent/very good/good	4370 (89.7%)	3082 (90.2%)	1238 (88.6%)
Fair/poor	492 (10.1%)	330 (9.7%)	154 (11.0%)
Don't Know	11 (0.2%)	5 (0.2%)	5 (0.4%)
Location of residence[b]	n=4,752	n=3,348	n=1,354
Urban	3962 (83.4%)	2791 (83.4%)	1132 (83.6%)
Rural	751 (15.8%)	531 (15.9%)	209 (15.4%)
Outside Canada	39 (0.8%)	26 (0.8%)	13 (1.0%)

[a] 61 respondents did not identify their gender

[b] 4405 (92.7%) respondents resided in Ontario and 308 (6.5%) in another Canadian province or territory.

Table 2. Loneliness and social connection in a sample of older Canadians, May 2020.

	All (N=4,879)[a]	Women (N=3,421)	Men (N=1,397)	P-value
Self-reported loneliness in past seven days	n=4,840	n=3,398	n=1,383	
Did not feel lonely	2675 (55.3%)	1684 (49.6%)	958 (69.3%)	<0.001
Lonely some of the time	1684 (34.8%)	1360 (40.0%)	307 (22.2%)	
Lonely always or often	404 (8.3%)	315 (9.3%)	83 (6.0%)	
Don't know	77 (1.6%)	39 (1.1%)	35 (2.5%)	
Strategies used to avoid feeling lonely [b]				
Connect with a friend or family member	3841 (78.7%)	2808 (82.1%)	988 (70.7%)	<0.001
Get fresh air	3134 (64.2%)	2235 (65.3%)	865 (61.9%)	0.025
Stay busy with work or projects	1855 (38.0%)	1275 (37.3%)	563 (40.3%)	0.049
Get active	1632 (33.5%)	1137 (33.2%)	470 (33.6%)	0.785
Try to get proper rest and sleep	1221 (25.0%)	806 (23.6%)	397 (28.4%)	<0.001
Engage in a hobby	1012 (20.7%)	704 (20.6%)	297 (21.3%)	0.597
Spend time with my pet	612 (12.5%)	473 (13.8%)	129 (9.2%)	<0.001
Other	347 (7.1%)	248 (7.3%)	95 (6.8%)	0.582
Frequency of speaking with a friend, family member or neighbour	n=4,865	n=3,412	n=1394	
Not at all	18 (0.4%)	4 (0.1%)	13 (0.9%)	<0.001
1-4 times	1401 (28.8%)	845 (24.8%)	535 (38.4%)	
5-7 times	3446 (70.8%)	2563 (75.1%)	846 (60.7%)	
Uses social networking websites or apps to communicate with friends and family	n=4,868	n=3,418	n=1394	
Yes	4113 (84.5%)	2983 (87.3%)	1090 (78.2%)	<0.001
No	751 (15.4%)	434 (12.7%)	301 (21.6%)	
Don't know	4 (0.1%)	1 (0.0%)	3 (0.2%)	

Table 2.Loneliness and social connection in a sample of older Canadians, May 2020 (Continued)

	All (N=4,879)[a]	Women (N=3,421)	Men (N=1,397)	P-value
Apps used [b]				
Facebook	3031 (62.1%)	2235 (65.3%)	768 (55.0%)	<0.001
Zoom	2558 (52.4%)	1918 (56.1%)	617 (44.2%)	<0.001
FaceTime	2444 (50.1%)	1874 (54.8%)	546 (39.1%)	<0.001
WhatsApp	1182 (24.2%)	931 (27.2%)	239 (17.1%)	<0.001
Instagram	1125 (23.1%)	914 (26.7%)	201 (14.4%)	<0.001
Skype	772 (15.8%)	523 (15.3%)	244 (17.5%)	0.061
Twitter	575 (11.8%)	429 (12.5%)	141 (10.1%)	0.017
Google Hangouts/Meet	322 (6.6%)	255 (7.5%)	64 (4.6%)	<0.001
Houseparty	212 (4.4%)	178 (5.2%)	34 (2.4%)	<0.001
Other	368 (7.5%)	275 (8.0%)	89 (6.4%)	0.047
Devices used [b]				
Smartphone	3026 (62.0%)	2204 (64.4%)	791 (56.6%)	<0.001
Desktop/laptop	2579 (52.9%)	1704 (49.8%)	846 (60.6%)	<0.001
Landline telephone	2528 (51.8%)	1776 (51.9%)	714 (51.1%)	0.612
Tablet	2283 (46.8%)	1659 (48.5%)	594 (42.5%)	<0.001
Other	172 (3.5%)	136 (4.0%)	33 (2.4%)	0.006

[a] 61 respondents did not identify their gender

[b] categories not mutually exclusive

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020.

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Sociodemographic characteristics						
Age, years						
<65 (ref)	440 (52.8)	--	--	65 (38.5)	--	--
65-79	1110 (49.3)	0.87 (0.74-1.02)	0.84 (0.72-0.99)	248 (27.1)	0.59 (0.42-0.84)	0.56 (0.39-0.78)
80+	125 (46.3)	0.77 (0.59-1.01)	0.70 (0.53-0.92)	77 (29.5)	0.67 (0.45-1.01)	0.61 (0.40-0.92)
Living arrangement						
Lives with others (ref)	935 (43.0)	--	--	242 (23.0)	--	--
Lives alone	714 (63.6)	2.32 (2.00-2.67)	2.50 (2.14-2.92)	137 (54.2)	3.95 (2.97-5.26)	3.86 (2.88-5.18)
Ethnicity						
White (ref)	1565 (50.5)	--	--	357 (29.2)	--	--
Non-White	77 (41.6)	0.70 (0.52-0.94)	0.70(0.51-0.95)	19 (26.4)	0.87(0.51-1.49)	0.83(0.48-1.43)
Residence of location						
Urban (ref)	1378 (50.4)	--	--	312 (28.5)	--	--
Rural	256 (48.7)	0.94 (0.78-1.13)	0.93 (0.77-1.13)	58 (29.2)	1.03 (0.74-1.44)	1.09 (0.78-1.54)
Health status						
Good (ref)	1456 (48.1)	--	--	324 (27.0)	--	--
Fair/Poor	216 (66.9)	2.18 (1.71-2.78)	2.24 (1.76-2.86)*	65 (45.1)	2.22(1.56-3.16)	2.34 (1.64-3.34)[a]
Caregiver to another person						
No (ref)	1198 (49.4)	--	--	304 (28.5)	--	--
Yes	469 (51.0)	1.07 (0.92-1.25)	1.05 (0.90-1.23)	83 (30.1)	1.08 (0.81-1.44)	1.03 (0.77-1.39)
Receives care						
No (ref)	1447 (48.5)	--	--	319 (27.5)	--	--
Yes	220 (61.1)	1.67 (1.33-2.09)	1.55 (1.23-1.97)	68 (37.6)	1.59(1.15-2.20)	1.39 (0.97-2.00)

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020 (Continued).

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Social Support						
Social media use						
No (ref)	213 (50.1)	--	--	91 (31.5)	--	--
Yes	1458 (49.8)	0.99(0.80-1.21)	1.00 (0.81-1.23)	299 (28.4)	0.86(0.65-1.14)	0.90 (0.68-1.20)
Communication frequency[b]						
None or low (ref)	120 (68.6)	--	--	55 (36.9)	--	--
High	1551 (48.9)	0.44 (0.32-0.61)	0.47 (0.34-0.66)	334 (27.9)	0.66 (0.46-0.95)	0.74 (0.61-1.06)
Received offers of assistance[c]						
No (ref)	1016 (52.5)	--	--	253 (28.7)	--	--
Yes	650 (46.3)	0.78 (0.68-0.90)	0.79 (0.69-0.91)	136 (29.5)	1.04 (0.81-1.33)	1.05 (0.82-1.36)
Attitudes and behaviours towards COVID-19						
Concern for pandemic						
Low level (ref)	260 (42.1)	--	--	62 (19.8)	--	--
High level	1407 (51.6)	1.47 (1.23-1.75)	1.46 (1.22-1.74)	328 (31.8)	1.90 (1.40-2.58)	1.86 (1.36-2.53)
Extent practising physical distancing						
None/some (ref)	155 (47.3)	--	--	40 (22.5)	--	--
Most of time	1231 (49.9)	1.11(0.88-1.40)	1.06 (0.84-1.34)	295 (29.9)	1.47(1.01-2.15)	1.41 (0.96-2.07)
All of time	283 (51.4)	1.18 (0.90-1.55)	1.06(0.80-1.40)	55 (30.7)	1.53 (0.95-2.46)	1.31 (0.80-2.14)
No perceived positive effects of distancing						
No (ref)	1331 (46.7)	--	--	306 (27.5)	--	--
Yes	344 (67.3)	2.35(1.92-2.86)	2.25 (1.84-2.75)	84 (35.9)	1.48(1.10-1.99)	1.44 (1.06-1.95)

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020 (Continued).

	Women			Men		
	n (%) Lonely	**Unadjusted OR (95% CI)**	**Age- & health-adjusted OR (95% CI)**	**n (%) Lonely**	**Unadjusted OR (95% CI)**	**Age- & health-adjusted OR (95% CI)**
Change in daily routine						
No (ref)	46 (34.9)	--	--	6 (8.2)	--	--
Yes	1623 (50.4)	1.90 (1.32-2.74)	2.02 (1.39-2.92)	383 (30.2)	4.83(2.08-11.24)	5.57(2.37-13.11)

[a] Adjusted for age group only.

[b] Self-reported communication with friends, family members or neighbours.

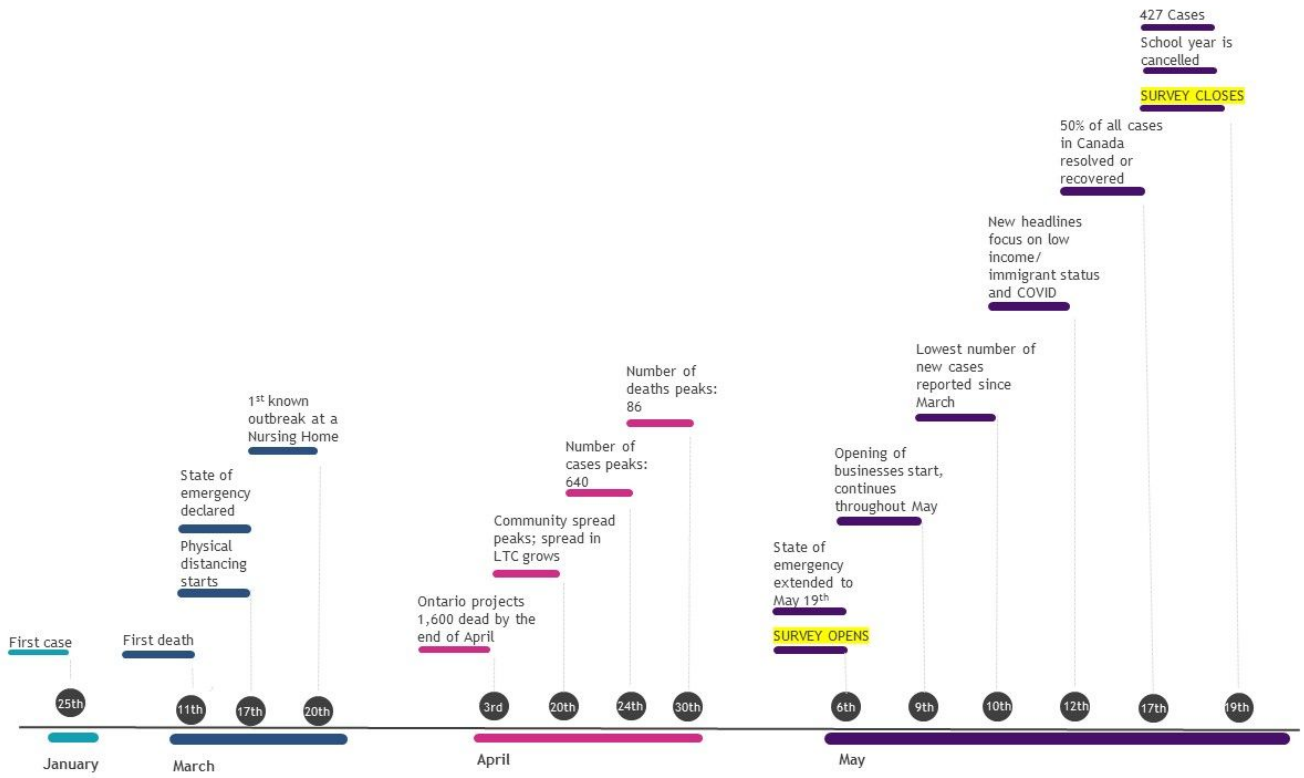
[c] Reported receiving offers of assistance from their community to help with daily life during COVID-19 distancing measures.

Table 4. Odds ratios (OR) for loneliness (sex-pooled) in a sample of older Canadians, May 2020.

	All respondents			
	Unadjusted OR (95% CI)	Age- & sex-Adjusted OR (95% CI)	Age-, sex-, & health status-Adjusted OR (95% CI)	Fully[a] adjusted OR (95% CI)
Sociodemographic				
Female sex (ref male)	2.44 (2.13-2.80)	2.38 (2.07-2.73)	2.41 (2.09-2.77)	
Women living alone				1.52 (1.13-2.04)
Women living with others				2.44 (2.04-2.92)
Age, years				
65-79 (ref <65)	0.74 (0.64-0.86)	0.81 (0.70-0.94)	0.78 (0.67-0.90)	0.69 (0.59-0.81)
80+ (ref <65)	0.61 (0.49-0.75)	0.79 (0.63-0.98)	0.72 (0.57-0.90)	0.50 (0.39-0.65)
Living alone	2.83 (2.49-3.22)	2.78 (2.42-3.18)	2.74 (2.39-3.15)	
Living alone in women				2.65 (2.26-3.11)
Living alone in men				4.26 (3.15-5.76)
Non-white ethnicity	0.75 (0.58-0.97)	0.74 (0.57-0.96)	0.72 (0.55-0.94)	0.71 (0.54-0.94)
Rural	0.98 (0.83-1.15)	0.95 (0.81-1.12)	0.96 (0.82-1.13)	1.07 (0.90-1.27)
Fair or poor health status	2.14 (1.76-2.60)	2.25 (1.84-2.76)	--	1.93 (1.54-2.41)
Caregiver to another person	1.14 (1.00-1.30)	1.04 (0.91-1.20)	1.05 (0.91-1.20)	1.18 (1.02-1.37)
Receives care	1.54 (1.29-1.84)	1.76 (1.45-2.12)	1.50 (1.24-1.83)	1.47 (1.19-1.81)
Social support				
Social media use	1.08 (0.92-1.26)	0.93 (0.78-1.09)	0.96 (0.81-1.14)	1.13 (0.94-1.36)
High communication frequency	0.65 (0.52-0.81)	0.53 (0.42-0.68)	0.57 (0.45-0.72)	0.55 (0.43-0.72)
Received offers of assistance	0.89 (0.79-1.00)	0.85 (0.75-0.96)	0.85 (0.75-0.96)	0.79 (0.69-0.90)
Attitudes and behaviours towards COVID-19				
High concern for pandemic	1.65 (1.42-1.91)	1.59 (1.37-1.86)	1.56 (1.33-1.82)	1.55 (1.31-1.84)
Extent practising distancing				
Most of time (ref none/some)	1.27 (1.05-1.53)	1.19 (0.98-1.45)	1.15 (0.95-1.40)	1.23 (0.99-1.53)
All of time (ref none/some)	1.39 (1.11-1.75)	1.29 (1.02-1.64)	1.13 (0.89-1.44)	1.12 (0.86-1.45)
No perceived positive effects of pandemic distancing measures	1.90 (1.62-2.22)	2.07 (1.76-2.43)	1.97 (1.67-2.32)	1.94 (1.62-2.32)
Reported change in routine	2.36 (1.72-3.24)	2.30 (1.67-3.19)	2.50 (1.80-3.48)	2.81 (1.96-4.03)

[a] Adjusted for all covariates listed in the table with an interaction term for sex and living alone (P-value =0.006).

Figure 1. Timeline of COVID-19 in Ontario, Canada's largest province.



Physical distancing measures beginning March 17 included closure of all indoor recreational facilities, public libraries, theatres, cinemas, bars, and restaurants. Publicly funded schools were closed by this point as well, and all employers in Ontario were asked to facilitate virtual work arrangements for employees. Remaining non-essential businesses were closed March 25. Gatherings of more than 5 people were prohibited on March 28. On March 30, Ontario's Chief Medical Officer of Health strongly recommended individuals over 70 years of age or those with compromised immune systems or underlying medical conditions to stay at home. Source: CIHI, COVID-19 Intervention Scan, Accessed Aug 11 2020, https://www.cihi.ca/en/covid-19-intervention-scan

Supplement. Loneliness among older adults in the community during COVID-19

eAppendix. Questionnaire

The Impact of COVID-19 Physical Distancing Measures on Older Canadians and Strategies to Address Unmet Needs: A Survey of Retired Educators

Introduction

Welcome! Thank you for agreeing to participate in this survey. We value your opinions and we appreciate your participation in this process.

The Study Information Sheet will answer many of your questions and reviews your rights and responsibilities as a participant in this research project. You can access the Study Information Sheet by clicking this link. You may print a copy of the Study Information Sheet for your records.

If you have additional questions, please contact Joyce Li, Research Coordinator (joyce.li@wchospital.ca) before continuing further.

Electronic Consent

Please select your choice below. Clicking on the "Agree" button indicates your confirmation that:

This research study has been fully explained to me and all of my questions answered to my satisfaction
I understand the requirements of participating in this research study
I have been informed of the risks and benefits, if any, of participating in this research study
I have been informed of any alternatives to participating in this research study
I have been informed of the rights of research participants
I have read each page of the Study Information Sheet
I have agreed to participate in this research study

Electronic Consent

- ○ Agree
- ○ Disagree

The Coronavirus pandemic (COVID-19) is impacting all Canadians but older adults are experiencing its impacts in unique ways. This survey will help us understand if and how COVID-19 is affecting your health, as well your social circumstances and supports you have available. This information will be used by researchers at Women's College Hospital as well as RTOERO leadership to develop supports for older adults and for our members during and after the COVID-19 pandemic. The survey is anonymous and will take about 10-20 minutes to complete.

A) Daily life during COVID-19

1. To what extent would you agree with the following statement: The Covid-19 crisis has changed my daily routine.

- ○ Strongly Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ○ Strongly Disagree

○ Don't know

Comment:

2. How are you spending your time now? Select all that apply.

□ Watching more TV
□ More time on my hobbies
□ COVID-19-related community work (making masks, grocery shopping, meal or supply drop-offs, etc)
□ Working from home
□ Going on walks
□ More time exercising
□ More time cooking or baking
□ More time making or taking phone calls from friends/relatives
□ More time on the internet and social media
□ I am not spending my time differently than before COVID-19
□ Other, please specify:

3. Have you experienced any of the following difficulties due to COVID-19? Please select all that apply.

□ Getting/ordering groceries
□ Getting supplies (e.g. toilet paper, hand sanitizer, cleaning products, bleach, etc.)
□ Getting prescription medications
□ Accessing healthcare
□ Changes to planned health treatments (e.g. cancer treatment, outpatient procedure, surgery, etc).
Please Specify:
□ Other, please describe:
□ I have not experienced any difficulties

4. Although this is a challenging time, have you experienced any positive effects or 'silver linings' during this crisis? Please select all that apply.

□ Stronger sense of community
□ Feeling more connected to partner, family and friends
□ A growing respect for older adults and their needs by society (e.g. designated grocery shopping hours)
□ Slower pace of life / more time to relax or rest
□ No or less time spent commuting to work
□ Improved access to healthcare through virtual care
□ Other, please describe:
□ I have not experienced any positive effects of this crisis

Comment:

5. How concerned are you about the COVID-19 pandemic?

○ Extremely concerned
○ Very concerned
○ Moderately concerned
○ Slightly concerned
○ Not at all concerned

6. To what extent are you practising physical distancing?
- ○ All of the time. I am staying home all of the time.
- ○ Most of the time. I only leave my home to buy essentials or for necessary medical appointments.
- ○ Some of the time. I have reduced the amount of time I spend in public.
- ○ None of the time. I am doing everything that I normally do.

7. The COVID-19 pandemic and physical distancing measures have created new or additional concerns for many people. Select your top three concerns.
- □ Getting sick from COVID-19
- □ A loved one getting sick from COVID-19
- □ The health system becoming overloaded (not enough hospital beds or supplies)
- □ Not being able to meet basic needs (put food on the table or pay bills)
- □ Feeling lonely, anxious or depressed
- □ Limited access to routine healthcare
- □ Not being able to adequately take care of my health
- □ Not being able to adequately care for loved ones
- □ Not being able to visit loved ones in long-term care
- □ Family stress from confinement
- □ Unwittingly spreading COVID-19 (if sick without symptoms)
- □ My children or grandchildren's education or work
- □ Economic recession and retirement savings
- □ Other – please indicate:

8. In the past 4 weeks, have you been in close contact with a person who has tested positive for COVID-19?
- ○ Yes
- ○ No
- ○ Don't know

9. In the past 4 weeks, have you been ill with a cold or flu-like illness?
- ○ Yes
- ○ No
- ○ Don't know

10. Have you been tested for COVID-19?
- ○ Yes, I was tested and was positive
- ○ Yes, I was tested and was negative
- ○ No, I tried to get tested but could not get a test
- ○ No, I have not tried to get tested

B) Caregiving and receiving care

11. Do you provide assistance to another person because of a health condition or limitation? By assistance we mean personal care, medical treatments, scheduling or coordinating care-related tasks, meal preparation, house maintenance, transportation, social or emotional support, mobility, or financial assistance or management. Please exclude any assistance you provided as part of a volunteer organization or paid job.
- ○ Yes
- ○ No

- Don't Know

Do you live in the same household as this person?
- Yes
- No
- Don't Know

Has the COVID-19 crisis impacted your ability to give care? In what way?
- Yes, please specify:
- No
- Don't know

Comment:

12. Do you receive assistance from family, friends, or neighbours because of a health condition or limitation that affects your daily activities?
- Yes
- No
- Don't Know

Does your caregiver live in the same household as you?
- Yes
- No
- Don't Know

Has the COVID-19 crisis impacted your ability to receive care? In what way?
- Yes, please specify:
- No
- Don't know

C) Social connections during COVID-19

To reduce the spread of COVID-19, the government and public health officials have asked Canadians to practise physical distancing (i.e. minimizing close contact with others). While physical distancing is necessary to slow the spread of disease, it may lead to loneliness, anxiety or depression.

13. In the past seven days, which statement best applies?
- I did not feel lonely.
- I felt lonely one or two days.
- I felt lonely several days.
- I felt lonely most days.
- I felt lonely every day.
- Don't know.

Comment:

14. What steps do you take to avoid feeling lonely? Please select up to three strategies you use most often.

□ Connect with a friend or family member
□ Get fresh air
□ Get active
□ Stay busy with work or projects
□ Engage in a hobby
□ Try to get proper rest and sleep
□ Spend time with my pet
□ Other, please share any strategies:
□ Please share with us any specific resources you use to avoid feeling lonely (e.g., participating in a virtual book club):

15. In the past seven days, how often did you speak with a friend, family member or neighbour?

○ Not at all
○ 1-2 times
○ Several times (3-4 times)
○ Almost every day (5-6 times)
○ Every day (7 times)

D) Use of technology to stay socially connected

Digital technologies can help us stay socially connected as we practise physical distancing.

16. Do you have access to the Internet at home?

○ Yes
○ No
○ Don't Know

What are the reasons you do not have access to the internet at home? Select all that apply.

□ No need or no interest
□ Cost (service or equipment)
□ The available service does not meet our needs
□ Security or privacy concerns (e.g. viruses, use of personal information)
□ Lack of confidence, knowledge, or skills
□ No Internet-ready device (e.g. desktop computer) available in household
□ Other, please specify:

How would you rate the internet connection in your home?

○ Very good
○ Good
○ Moderate
○ Poor
○ Don't know

17. Do you have a smartphone that you use for personal use? A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded applications, e.g. Apple iPhone and Samsung Galaxy

○ Yes
○ No

- Don't know

18. Do you use any social networking websites (e.g. Facebook) or apps (e.g. Zoom or FaceTime) to communicate with friends and family?

- Yes
- No
- Don't know

Please check which sites or apps you use (check all that apply)

- ☐ Facebook
- ☐ Instagram
- ☐ Twitter
- ☐ WhatsApp Messenger
- ☐ Zoom
- ☐ Skype
- ☐ Face Time
- ☐ Houseparty
- ☐ Google Hangouts/meet
- ☐ Other, please specify:

19. What devices do you use most often when connecting with friends and family? Please select all that apply.

- ☐ Desktop/Laptop
- ☐ Tablet
- ☐ Smartphone
- ☐ Landline telephone
- ☐ Other, please specify:

Comment:

E) Supporting older adults during the COVID-19

20. In your view, what are the most pressing needs of older adults during the COVID-19 pandemic? Please select up to 3 issues.

- ☐ Support for caregivers
- ☐ Access to (routine?) healthcare to maintain physical health
- ☐ Resources or supports on how to stay physically healthy during the COVID-19
- ☐ Resources or supports on how to stay mentally healthy during the COVID-19
- ☐ Programs or supports to ensure basic needs are met (e.g. foodbanks, home meal delivery, income supplements, etc.)
- ☐ Policies and procedures to ensure safety of older adults in long-term care
- ☐ Strategies to ensure older adults are able to stay connected with loved ones in long-term care
- ☐ Strategies to help older adults stay socially connected while physically distanced
- ☐ Other, please specify:

Comment:

21. To what extent do you agree or disagree with the following statements?

	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
a. I have received offers of assistance from my community to help with daily life during stay at home and physical distancing measures.	○	○	○	○	○
b. Governments and policy makers care about the health and well-being of older adults.	○	○	○	○	○
c. The level of respect for older adults in society has decreased during the COVID-19 pandemic.	○	○	○	○	○
d. I have witnessed ageism in the daily news and popular culture during the COVID-19 pandemic.	○	○	○	○	○

Comment:

F) Sociodemographics

23. Your age

- ○ 54 or younger
- ○ 55-59
- ○ 60-64
- ○ 65-69
- ○ 70-74
- ○ 75-79
- ○ 80+

24. Your gender

- ○ Female
- ○ Male
- ○ Prefer to self identify
- ○ Prefer not to say

25. Including yourself, how many persons are living in your household?

26. Do you have access to private outdoor space (e.g. backyard, terrace or balcony)?

- ○ Yes
- ○ No
- ○ Don't Know

27. How would you describe your ethnic identity?

- ○ Black/African Canadian
- ○ Central/South American

- Chinese
- Filipino
- Indigenous
- South Asian (Indian, Sri Lankan, etc.)
- Southeast Asian (Japanese, Vietnamese, Korean, Cambodian, etc.)
- West Asian (Arabian, Egyptian, Iranian, Afghan, etc.)
- White/Caucasian (European, Russian, etc.)
- Other, please specify:
- Prefer to self-identify
- Prefer not to say

28. What language do you speak most often at home?

- English
- French
- Other, please indicate:

29. In general, would you say your health is... ?

- Excellent
- Very good
- Good
- Fair
- Poor
- Don't Know

30. What are the first 3 digits of your postal code?

G) Overall comments and suggestions

31. How can RTOERO and the Foundation support members during the COVID-19 pandemic?

32. Other comments or suggestions

You have opted not to consent to participate at this time. Thank you for considering the invitation to participate in this survey project.

eMethods. Exposure Variable Definitions

Sociodemographic	Definition
Sex	Based on self-identification as female or male.
Age	Categorized as <65 years if respondent's selected age was '54 or younger', '55-59', or '60-64'; as 65-79 years if they selected '65-69', '70-74' or '75-79'; and as 80+ if they selected '80+'.
Living arrangement	Classified as living alone if reported 1 person living in their household (i.e. themselves) and as living with others if reported >1 person living in their household.
Ethnicity	Classified as white if respondents identified themselves as 'White/Caucasian' or they identified as 'Other' but specified white, Caucasian, Hebrew/Jewish, or white European ethnicity, e.g. Italian, French, Irish, Greek, Welsh, Scottish, etc. Central/South American and Filipino were regrouped into the Other category due to small numbers.
Rural residence	Classified as rural if second digit of reported Canadian postal code was a '0', and outside Canada if no match to a Canadian postal code.[1]
Health status	Classified as 'fair or poor' based on self-reporting fair or poor health; and as 'good' if 'excellent', 'very good' or 'good' health was reported.
Caregiver	Classified as a caregiver if responded that they aid another person because of a health condition or limitation.
Care recipient	Classified as a care recipient if they reported receiving assistance from another person because of a health condition or limitation.
Social support	
Social media use	Classified as yes if respondent reported using any social networking websites (e.g. Facebook) or apps (e.g. Zoom or FaceTime) to communicate with friends and family.
Frequency of communication	Classified as 'high frequency' if reported speaking with a friend, family member or neighbour≥3 times in the prior week.
Receipt of offers of assistance	Classified as yes if respondent strongly or somewhat agreed to the statement "I have received offers of assistance from my community to help with daily life during stay at home and physical distancing measures."
Attitudes and behaviours towards COVID-19	
Level of concern	Classified as 'high concern' if respondent reported they were 'extremely' or 'very concerned' about the COVID-19 pandemic.
Extent practicing physical distancing	Classified as 'all of the time', 'most of the time' or 'some of the time or none' based on self-report.
Change in routine	Classified as yes if respondent strongly or somewhat agreed that the Covid-19 crisis changed their daily routine, and as no if respondent was neutral, or somewhat or strongly disagreed with the statement.

References

1. Statistics Canada. How Postal Codes Map to Geographic Areas. 2007. https://www150.statcan.gc.ca/n1/en/pub/92f0138m/92f0138m2007001-eng.pdf?st=VjySvIB3. Accessed June 30, 2020.

eTable 1. Impact of COVID-19 on daily life reported by a sample of older Canadians, May 2020

	All (N=4,879)[a]	Female (N=3,421)	Male (N=1,397)	P-Value
The COVID-19 crisis has changed my daily routine	n=4,863	n=3,412	n=1,390	
Strongly Agree	3211 (66.0%)	2304 (67.5%)	878 (63.2%)	0.0047
Somewhat Agree	1438 (29.6%)	973 (28.5%)	436 (31.4%)	
Neutral	91 (1.9%)	56 (1.6%)	35 (2.5%)	
Somewhat Disagree	87 (1.8%)	60 (1.8%)	25 (1.8%)	
Strongly Disagree	35 (0.7%)	18 (0.5%)	16 (1.2%)	
Don't know	1 (0.0%)	1 (0.0%)	0	
How time is being spent [b]				
More time on the internet and social media	3584 (73.5%)	2562 (74.9%)	978 (70.0%)	0.0005
Going on walks	3128 (64.1%)	2260 (66.1%)	835 (59.8%)	<0.0001
Watching more TV	2877 (59.0%)	2039 (59.6%)	805 (57.6%)	0.2050
More time making or taking phone calls from friends/relatives	2593 (53.2%)	2026 (59.2%)	543 (38.9%)	<0.0001
More time cooking or baking	2517 (51.6%)	2001 (58.5%)	489 (35.0%)	<0.0001
More time on my hobbies	2073 (42.5%)	1527 (44.6%)	518 (37.1%)	<0.0001
More time exercising	1111 (22.8%)	780 (22.8%)	320 (22.9%)	0.9367
COVID-19-related community work	592 (12.1%)	500 (14.6%)	83 (5.9%)	<0.0001
Working from home	431 (8.8%)	291 (8.5%)	136 (9.7%)	0.1733
Other	987 (20.2%)	691 (20.2%)	283 (20.3%)	0.9631
Cleaning, home renovations, gardening, organizing/decluttering	308 (6.3%)			
Reading	198 (4.1%)			
Not spending my time differently than before COVID-19	179 (3.7%)	89 (2.6%)	86 (6.2%)	<0.0001
Difficulties experienced [b]				
Getting supplies (e.g. toilet paper, hand sanitizer, cleaning products, bleach, etc.)	2029 (41.6%)	1471 (43.0%)	528 (37.8%)	0.0009
Getting/ordering groceries	1611 (33.0%)	1130 (33.0%)	459 (32.9%)	0.9066
Changes to planned health treatments (e.g. cancer treatment, outpatient procedure, surgery, etc).	1296 (26.6%)	890 (26.0%)	388 (27.8%)	0.2098
Accessing healthcare	1040 (21.3%)	697 (20.4%)	326 (23.3%)	0.0226
Getting prescription medications	687 (14.1%)	448 (13.1%)	230 (16.5%)	0.0023
Other	776 (15.9%)	602 (17.6%)	171 (12.2%)	<0.0001
Prescription, medications on backorder	40 (0.8%)			
No difficulties experienced	1353 (27.7%)	939 (27.5%)	398 (28.5%)	0.4638

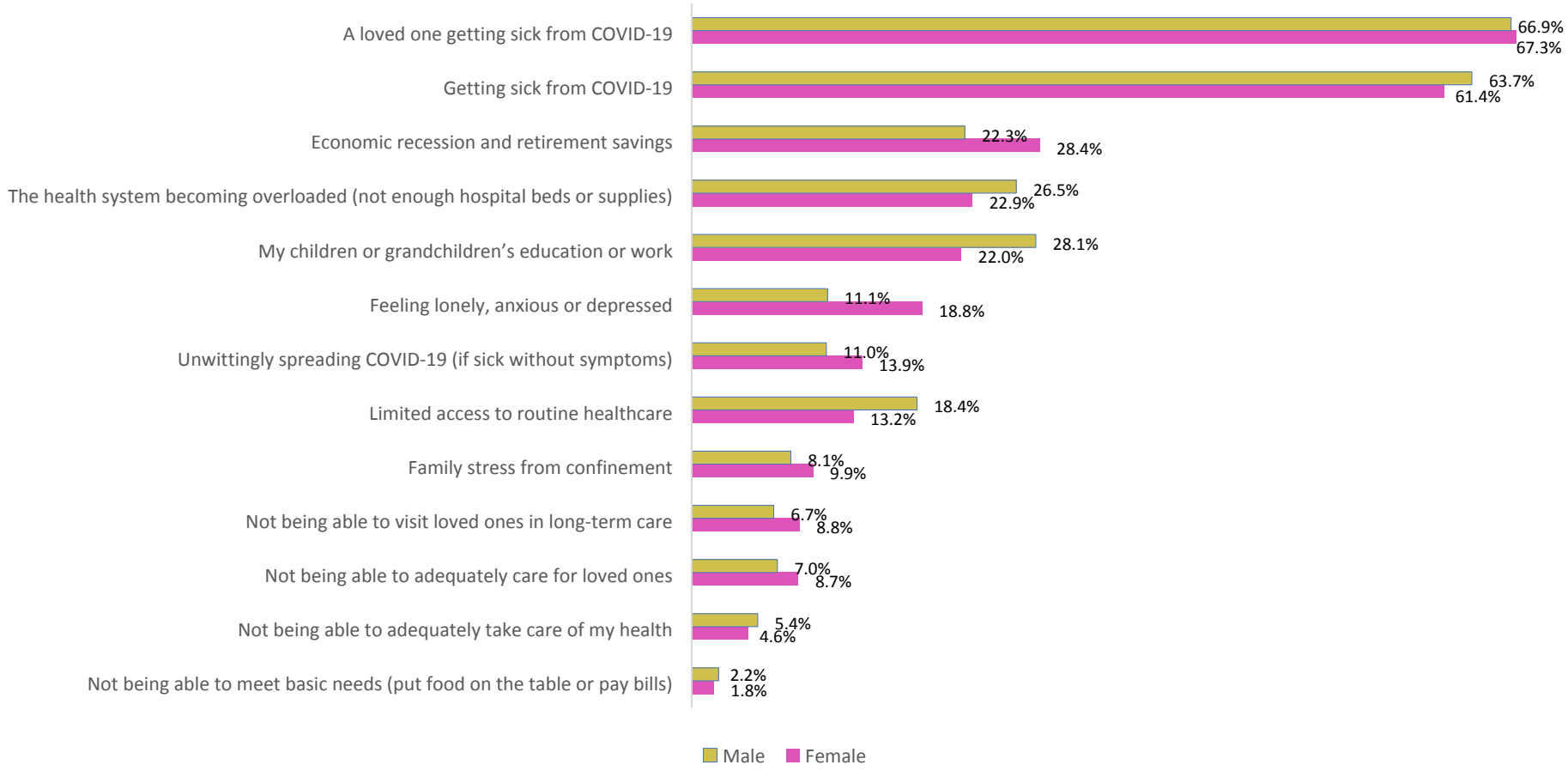
eTable 1. Impact of COVID-19 on daily life reported by a sample of older Canadians, May 2020 (Continued)

	All (N=4,879)[a]	Female (N=3,421)	Male (N=1,397)	P-Value
Positive effects experienced [b]				
Slower pace of life / more time to relax or rest	2583 (52.9%)	1879 (54.9%)	673 (48.2%)	<0.0001
Feeling more connected to partner, family and friends	2062 (42.3%)	1405 (41.1%)	629 (45.0%)	0.0117
A growing respect for older adults and their needs by society	1778 (36.4%)	1279 (37.4%)	473 (33.9%)	0.0209
Stronger sense of community	1571 (32.2%)	1129 (33.0%)	429 (30.7%)	0.1225
No or less time spent commuting to work	341 (7.0%)	240 (7.0%)	96 (6.9%)	0.8590
Improved access to healthcare through virtual care	190 (3.9%)	143 (4.2%)	47 (3.4%)	0.1868
Other	492 (10.1%)	374 (10.9%)	113 (8.1%)	0.0030
None experienced	778 (16.0%)	519 (15.2%)	246 (17.6%)	0.0356

[a] 61 respondents did not identify their gender

[b] categories not mutually exclusive

eFigure 1. Top new or additional concerns related to COVID-19 and physical distancing measures reported by survey respondents, May 2020.



Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Checklist Item	***Explanation***	***Page Number***
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	5
IRB approval	Mention whether the study has been approved by an IRB.	6
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	6
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	7
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	6-7
Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	5
Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	5
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	5
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	5
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	NA
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	6
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	6

Time/Date	In what timeframe were the data collected?	5
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	NA
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	7
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	NA
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	NA
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.	NA
Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	NA
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	NA
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	NA
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate.	NA
Completion rate (Ratio of users who finished the survey/users who	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a measure for how completely	7

agreed to participate)	questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)	
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	NA
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	8
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	NA
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	NA

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Loneliness among older adults in the community during COVID-19

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Loneliness among older adults in the community during COVID-19

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Abstract

Objective: Physical distancing and stay-at-home measures implemented to slow transmission of novel coronavirus disease (COVID-19) may intensify feelings of loneliness in older adults, especially those living alone. Our aim was to characterize the extent of loneliness during the first wave in a sample of older adults living in the community and assess characteristics associated with loneliness.

Design: Online cross-sectional survey between May 6 - 19, 2020

Setting: Ontario, Canada

Participants: Convenience sample of members of a national retired educators' organization.

Primary outcome measures: Self-reported loneliness, including differences between women and men.

Results: 4879 respondents (71.0% women; 67.4% 65-79 years) reported that in the preceding week, 43.1% felt lonely at least some of the time, including 8.3% that felt lonely always or often. Women had increased odds of loneliness compared to men, whether living alone (adjusted Odds Ratio (aOR) 1.52 [95% Confidence Interval (CI) 1.13-2.04]) or with others (2.44 [95% CI 2.04-2.92]). Increasing age group decreased the odds of loneliness (aOR 0.69 [95% CI 0.59-0.81] 65-79 years and 0.50 [95% CI 0.39-0.65] 80+ years compared to <65 years). Living alone was associated with loneliness, with a greater association in men (aOR 4.26 [95% CI 3.15-5.76]) than women (aOR 2.65 [95% CI 2.26-3.11]). Other factors associated with loneliness included: fair or poor health (aOR 1.93 [95% CI 1.54-2.41]), being a caregiver (aOR 1.18 [95% CI 1.02-1.37]), receiving care (aOR 1.47 [95% CI 1.19-1.81]), high concern for the pandemic (aOR 1.55 [95% CI 1.31-1.84]), not experiencing positive effects of pandemic distancing measures (aOR 1.94 [95% CI 1.62-2.32]), and changes to daily routine (aOR 2.81 [95% CI 1.96-4.03]).

Conclusions: While many older adults reported feeling lonely during COVID-19, several characteristics – such as being female and living alone – increased the odds of loneliness. These characteristics may help identify priorities for targeting interventions to reduce loneliness.

Strengths and limitations of this study

- This study leveraged a strong community-based partnership to obtain timely data from a large sample of older Canadians on the impacts of the first wave of COVID-19.
- This study identified several characteristics that increased the odds of loneliness, which may help to identify priorities for targeted interventions to reduce loneliness.
- The data were based on a convenience sample of retired, educational staff, who are not fully representative of the Canadian population. The perspectives of vulnerable groups who may be at greater risk for loneliness (e.g. those with severe mental health illness, low income, no home internet access, etc.) are likely underrepresented in this sample.

Background

As data emerge on how common, yet harmful, it is to be lonely, loneliness is increasingly recognized as a public health priority. In the United States, more than 40% of respondents to the nationally representative Health and Retirement Study reported feeling lonely.[1] In Canada, 1 in 4 older women and 1 in 5 older men report feeling lonely at least some of the time.[2] While feelings of loneliness can occur at any age, research has shown that rates of loneliness follow a nonlinear U-shaped distribution, with the highest levels reported in young (<25 years) and older (>65 years) adults.[3] While predisposing factors differ by life stage, older adults are at increased risk because they are more likely to experience events such as retirement, chronic illness, widowhood, and living alone.[4] Women report higher rates of loneliness than men,[2,4] possibly due to their longer life expectancy and greater likelihood of outliving their spouse, resulting in prolonged widowhood,[5,6] their caregiver roles,[2,7,8] lower incomes[9], and their greater tendency to acknowledge feeling lonely.[6] Addressing loneliness is important because of its profound impact on health and well-being, including increased risk for premature death,[10,11] cardiovascular disease, depression, dementia and even suicide.[12-18]

The novel coronavirus pandemic (COVID-19) and accompanying physical distancing and stay-at-home measures (i.e. closure of nonessential businesses and public spaces, as well as recommendations to practice physical distancing with anyone outside the home) are expected to intensify feelings of loneliness. Previous infectious disease outbreaks and pandemics have demonstrated increases in loneliness, anxiety, and depression from quarantine-induced social isolation.[19,20] Emerging research from the early stages of the COVID-19 pandemic support this hypothesis[21], with several studies demonstrating elevated rates of loneliness[22-24], psychological distress[25,26], and anxiety, depression and stress[27,28] during lock-down periods.

Understanding how older adults have been impacted by COVID-19 is vital to address their needs promptly and effectively and prevent unnecessary harms as the pandemic persists. Cross-sectional studies published as early as April 2020 examined public concerns regarding COVID-19 (e.g. becoming infected, reduced health care access) and its impact on daily life.[29,30] While valuable, these studies were conducted prior to or on the cusp of the implementation of physical distancing and stay-at-home measures, did not report on mental health, under-represented older adults[29], a key high-risk group, and did not explore important differences between women and men. More recently, McGinty et al published prevalence estimates of psychological distress and loneliness in the US; although, subgroup analyses focused on psychological distress rather than loneliness.[25]

More data on loneliness in older adults during COVID-19 continues to emerge as the pandemic unfolds[24,31-34], yet important knowledge gaps remain. A key gap is whether older women and men have shared, or unique, risk factors for loneliness during the pandemic. Pre-COVID-19, it has been shown that while there are common contributors to loneliness in older adults, like widowhood or declining health, some risk factors affect the sexes differently. For example, mobility problems have been shown to be a strong predictor of loneliness in women, while a reduced social network strongly predicts loneliness in men.[35] There is also comparatively little data on the relationship between COVID-19-specific factors (e.g. level of concern, impact to daily life, COVID-19 infection, etc)[22,24,32] and behaviours (e.g. use of technology for social connection) with loneliness in general, but particularly in older adults. Timely data relevant to older women and men are needed to inform public health responses and healthcare delivery.

We conducted an online cross-sectional survey to assess how the first wave of the COVID-19 pandemic affected older adults living in the community in Canada. Our objective was to characterize the extent of

loneliness in older adults, including differences between women and men, and examine factors associated with loneliness to identify groups likely to benefit most from intervention. We hypothesized that loneliness would be common, particularly in women and those living alone, and that higher pandemic concern would increase loneliness.

Methods

Study design and setting

A closed, online cross-sectional survey was administered to members of the RTOERO (formerly known as the Retired Teachers of Ontario) between May 6 and May 19, 2020. At this time in Ontario, Canada, physical distancing measures (e.g. lockdown) had been in place for about seven weeks; daily case and death counts were in decline after peaks in late April; and outbreaks in long-term care homes were a focus of news headlines (**Figure 1** for timeline).

RTOERO is a voluntary membership organization of more than 81,000 retired educators, administrators, and educational support staff, from child care, K-12 and post-secondary settings, that provides group health insurance benefits, as well as other programs and services, to the broader education community (https://www.rtoero.ca). Members were invited to participate by e-mail from RTOERO's chief executive officer. Two reminder emails were sent at 7 and 10 days. The survey was not publicly advertised. All members were eligible to participate if they had a registered e-mail address (~62,000). Study materials were provided in English and French. Our study design and reporting followed the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).[36]

The Research Ethics Board at Women's College Hospital in Toronto, Canada approved this study [#2020-0051-E]. A link to a study information sheet was provided on the survey's home page and informed

consent was obtained electronically. Participation was voluntary, and no incentives were provided. Minimal identifying personal information was collected (e.g. first three digits of postal code).

Questionnaire

The questionnaire was developed with RTOERO leadership and included 32 questions (**eAppendix** in the **Supplement**). Several questions were adapted with permission from the *Stanford Coronavirus Survey* (https://pcrt.stanford.edu/covid). Questions examined the impact of COVID-19 on daily life; loneliness; and the use of digital technologies for social connectivity. We used a single-item, direct measure of loneliness by asking respondents "In the past seven days, which statement best applies?" (I did not feel lonely; I felt lonely one or two days; I felt lonely several days; I felt lonely most days; I felt lonely every day). This approach was adapted from the *Canadian Longitudinal Study on Aging* (CLSA)[2] and the UK's *Community Life Survey*[37] which measure loneliness by directly asking "How often do you feel lonely?" (often/always, some of the time, occasionally, hardly ever or never). We chose this approach because it allowed respondents to self-report on loneliness, anchored their response to a time during the pandemic stay-at-home measures, and was considered more suitable for the pandemic context, where asking indirectly about feeling "left out" to infer loneliness may be less relevant as distancing and stay-at-home measures were universally applied.

Respondents were also asked about their history of COVID-19 symptoms and testing, the extent to which they were practising physical distancing and stay-at-home measures, and sociodemographic characteristics (i.e. age, sex, ethnicity, language, health status and location of residence). The ethnic response categories we used mirrored those used in Canada's national health survey.[38] The questionnaire was pretested in English with 18 RTOERO board members and staff, and in French by 1 staff member, for usability, technical functionality, clarity, flow, sensitive questions, and timing. Pretest results were not included in the final analysis.

Patient and public involvement

As noted above, RTOERO leadership (which comprise members of RTOERO) were involved in all aspects of the study, including questionnaire development, pretesting, and participant recruitment. Preliminary results were shared with the team and feedback was incorporated into the final analysis and manuscript. RTOERO's chief executive officer is a coauthor (JG) and critically reviewed the manuscript. Results were shared with RTOERO members through a webinar in the fall of 2020.

Data collection

The questionnaire was administered using SimpleSurvey™. Data were stored in an encrypted, password protected form on the secure Simple Survey server and were downloaded to the secure, password-protected Women's College Hospital server accessible to authorized team members. All questions were optional, so completeness checks were not performed; although, respondents were reminded of unanswered questions before proceeding to the next section to minimize incomplete data. We used adaptive questioning to reduce the complexity of questions.[36,39] Respondents were able to save their responses and return to the survey later to complete it. The survey completion rate was the number of respondents who finished the survey divided by the number consenting to participate.[36] Surveys were only analysed if the respondent clicked "Submit" and responded to more than one question.

Exposures

Sociodemographic characteristics - sex, age, living alone, ethnicity, rural residence, health status, and caregiver status – were collected, based on factors previously reported to be associated with loneliness.[4,5] We additionally collected self-reported measures of social support – communication frequency, receiving offers of assistance and social media use – as well as attitudes and behaviours towards COVID-19 hypothesized to contribute to loneliness, including level of concern, change in daily

routine, extent of physical distancing, and perceived positive effects of distancing measures. Variable definitions are presented in the **eMethods** in the **Supplement**.

Outcome

Our primary outcome was loneliness. Respondents were categorized as lonely 'always or often' if they reported feeling lonely every or most days in the preceding 7 days; lonely 'some of the time' if they reported feeling lonely on 1-2 or several days; and 'not lonely' if they reported they had not felt lonely at all. We further collapsed the first two categories to create a dichotomous variable for loneliness, where respondents were classified as lonely if they reported feeling lonely on 1 or more days in the preceding 7 days.[2,37]

Analysis

Chi-squared tests were used to identify sex differences. To identify predictors of loneliness for older women and men, exploratory analyses using sex-stratified and sex-pooled multivariable logistic regression models were conducted. In the sex-stratified regression analysis, we calculated unadjusted and minimally adjusted (age and health status) models, and used findings to inform which interactions to test for in the sex-pooled analysis. In the sex-pooled model, we additionally adjusted for all covariates and formally tested for sex interactions with explanatory factors, including age group, living alone, communication frequency, receiving offers of assistance, change in daily routine, and perceived positive effects of distancing measures, using interaction terms. Statistical tests were two sided, with $P < .05$ interpreted as statistically significant. Analyses were performed using SAS version 9.4.

Results

Overall, 5556 RTOERO members responded to the survey, of which 5509 provided consent. 4891 surveys were submitted, for a completion rate of 88.8%. We excluded 12 respondents who responded to ≤1 survey question, leaving 4879 respondents included in the analysis.

Characteristics

Most respondents were women (3421/4818 [71.0%]), between the ages of 65-79 years (3279/4863 [67.4%]) and completed the survey in English (97.6%) (**Table 1**). They were similar to the broader RTOERO membership in terms of sex (67% female), age distribution (14.5% <65 years; 64% 65-79 years; 21.5% ≥80 years) and preferred language (95% English) (personal communication, J. Grieve). One third of female respondents lived alone (1138/3356 [33.9%]) compared to one fifth of men (266/1351[19.7%]). Respondents were predominantly white (4454/4861 [91.6%]) and in good self-reported health (4370/4873 [89.7%]).

Less than 5% (236/4790 [4.9%]) reported a cold or flu-like illness in the preceding month. Overall, 8 of 4861 respondents tested positive for COVID-19 (0.2%). Most respondents strongly agreed that the COVID-19 pandemic had changed their daily routine (67.5% females vs. 63.2% males, P=0.0047). Additional data on the impact of COVID-19 are reported in e**Table 1** and **eFigure 1** of the **Supplement**.

Loneliness during COVID-19

Overall, 43.1% of respondents felt lonely at least some of the time (34.8% some of the time and 8.3% always or often) (**Table 2**). Women were more likely to report feeling lonely than males (P<0.001). Strategies to avoid feeling lonely included, connecting with a friend or family member (82.1% women vs. 70.7% men, P<0.001) and getting fresh air (65.3% vs. 61.9%, P=0.025). Seven percent (7.1%) described other strategies, such as reading, housework and/or gardening, and practising their faith. Most participants frequently spoke with a friend, family member or neighbour, although, a small proportion

(0.4%) had no connection at all. Many used social networking websites or apps (87.3% females vs. 78.2% males, P<0.001).

Sex-stratified model

Most factors associated with loneliness were shared amongst women and men (**Table 3**). Older age significantly reduced the odds of loneliness in both sexes after adjustment for self-reported health status. Living alone was associated with loneliness in both women and men; although, the association was greater in men (adjusted Odds Ratio (aOR) 3.86 [95% Confidence Interval (CI) 2.88-5.18] vs. aOR 2.50 [95% CI 2.14-2.92]). Self-reported poor health and higher concern for the pandemic were also associated with loneliness, as were experiencing change to a daily routine, and not experiencing any positive effects or 'silver linings' of pandemic distancing measures; effect sizes varied by sex. Among women, receiving offers of assistance (aOR 0.79 [95% CI 0.69-0.91]) and communicating more often with a friend, family member or neighbour (aOR 0.47 [95% CI 0.34-0.66]) reduced the odds of loneliness.

Sex-pooled model

Women had increased odds of loneliness compared to men, irrespective of living arrangement (aOR 1.52 [95% CI 1.13-2.04] living alone; aOR 2.44 [95%CI 2.04-2.92] living with others) (**Table 4**). Increasing age group was associated with decreasing odds of loneliness. The association of living alone with loneliness was significantly greater for men than women (aOR 4.26 [95% CI 3.15-5.76] vs. 2.65 [95% CI 2.26-3.11], P=0.006 for interaction term). Additional characteristics associated with loneliness included: self-reported fair/poor health (aOR 1.93 [95% CI 1.54-2.41]), being a caregiver (aOR 1.18 [95% CI 1.02-1.37]) and receiving care from a caregiver (aOR 1.47 [95% CI 1.19-1.81]). Pandemic-related factors associated with an increased odds of loneliness included having a high concern for the pandemic (aOR 1.55 [95% CI 1.31-1.84]), not experiencing any positive effects or 'silver linings' of pandemic distancing measures (aOR 1.94 [95% CI 1.62-2.32]) and experiencing change to a daily routine (aOR 2.81 [95% CI

1.96-4.03]). Non-white ethnicity (aOR 0.71 [95% CI 0.54-0.94]), high frequency of communication (aOR 0.55 [95% CI 0.43-0.72]) and receiving offers of assistance (aOR 0.79 [95% CI 0.69-0.90]) reduced the odds of loneliness. None of the other sex-based interactions we explored with explanatory factors were significant. Social media use was not associated with loneliness (aOR 1.13 [95% 0.94-1.36]) and the addition of an interaction term between social media use and age was similarly not significant.

Discussion

In a survey of 4879 older women and men, we found that loneliness was common during the COVID-19 pandemic, with more than one-third (34.8%) of respondents reporting feeling lonely some of the time and 8.3% feeling lonely always or often. More women reported feeling lonely than men and had higher odds of loneliness, despite controlling for factors hypothesized to contribute to sex differences including living alone, health status, and caregiving. Our findings are similar to reports from the UK, where 22.4% and 4.1% of older adults reported feeling lonely sometimes or often, respectively, in the first four weeks of lockdown[32], and from the US, where 13.8% (95% CI 11.4%-16.6%) of adults aged ≥18 years reported feeling lonely always or often at the beginning of April 2020.[25]

Living alone is as an important risk factor for loneliness, both pre-COVID-19[5,40,41] and during the pandemic.[31-33] We found that living alone predicted loneliness in women and men, although the effect was greater in men. Physical distancing and stay-at-home measures are anticipated to have a greater toll for those living alone as they severely limit opportunities for face-to-face interaction to combat loneliness.[33] The effect of living alone on loneliness may be greater in men because they tend to have fewer social contacts and close friends than women.[35,42,43] Indeed, male respondents in our survey communicated less frequently with family, friends, and neighbours, and were less likely to seek out social connection to mitigate loneliness. Having a smaller social network may exacerbate some of the

negative effects of living alone. Emerson recently found that older US adults who lived alone were less likely to have a close relationship that provided emotional security and well-being, and more likely to become 'more lonely' following the onset of COVID-19 than those living with others (42.4% vs. 27.9%).[31] Alternatively, our finding may be due to the inherent overlap in the constructs of 'living alone' and 'marital status' because we partially captured the impact of being widowed or unmarried in men versus women. Prior research has shown that being single has a greater impact on men's loneliness, possibly explained by the fact that for many older men, their partners are their main confidante and source of intimacy.[44,45]

We found that older adults' perceptions and pandemic experiences were also associated with loneliness. Respondents who had a high level of concern for COVID-19, experienced changes to their daily routine, and reported no perceived positive effects or 'silver livings' from the pandemic had increased odds of loneliness, while receiving offers of support and frequently communicating with family, friends and neighbours were protective. These findings underscore the importance of public health messages from the World Health Organization targeted at older adults, including maintaining regular routines or creating new ones that include exercise, regular cleaning/chores, and enjoyable activities; keeping in regular contact with loved ones; and restricting news consumption to specific times of day from reputable sources to reduce undue anxiety or distress.[46]

Family physician visits have been suggested as an important opportunity to screen for loneliness during COVID-19.[47,48] Particular attention is recommended to be paid to patients who are older, live alone or have pre-existing health conditions.[47] Our findings suggest that considering the patient's sex, if they have sufficient social support, and how the pandemic is affecting their daily routines could further assist in identifying at-risk individuals. Such questions would also be beneficial to align patients more purposefully with interventions. Virtual consultations and social prescribing (i.e. linking patients with nonclinical supports in their community such as outdoor exercise classes, walking groups, virtual

bereavement programs, etc) may be effective strategies to reduce loneliness during COVID-19 and beyond.[47,49,50] Additionally, the Campaign to End Loneliness recently profiled psychological approaches,[51] including cognitive behavioural therapy (CBT)[52,53], mindfulness[54], and positive psychology,[55] as promising interventions for addressing loneliness in older adults.

Lastly, technology can facilitate social connection and improve access to psychological interventions in the midst of physical distancing measures.[49,56] For older adults experiencing social loneliness as a result of being disconnected from their social network, websites or apps such as Facetime and Zoom can connect them to family and friends and provide continuity of group activities such as exercise classes, spiritual services, etc.[57] These platforms can similarly enable access to virtual CBT and other psychological supports.[57] One important consideration, however, is that, in order to be effective, older adults must want to, know how to use, and have access to these technologies.[57] Recent research shows that many older adults lack access to internet-enabled devices[58], and are unready for comparable technologies (i.e. video telemedicine visits) due to inexperience with technology or physical disability.[59] Consistent with prior research[31,60] and likely a function of electronic survey administration, we found high levels (~85%) of social media engagement, with no increased risk for loneliness overall or by age. Our findings suggest there is a large segment of the older adult population for whom digital media-based interventions may be effective for mitigating and alleviating loneliness. Services that teach older adults how to use and connect with family and friends through social media platforms may be valuable.[61] The importance of offline connection, however, should not be forgotten – phoning parents or older neighbours, and extending offers of assistance can go a long way to making someone feel connected and visible.[62]

A recent US study reported that 30.9% of older adults surveyed felt more lonely after COVID-19 related physical distancing was implemented.[31] Our estimates of loneliness were almost double that of the CLSA's collected between 2010-2015 using a similar age group and measurement approach (49.3% of

women and 27.1% men aged 65-79 years felt lonely some of the time vs. 24.7% and 17.9%, respectively, for adults aged 65-74 years).[2,63] Comparisons should be made cautiously considering differences in study populations. Longitudinal studies provide the most robust evidence of temporal changes. Using data collected at three time points, Luchetti et al found that older adults were the only group studied that showed a slight increase in loneliness in late March 2020 after social distancing measures were implemented in the US compared to the baseline assessment in January/February, although levels remained stable in April.[33] The study found that this increase was driven primarily by unavailable social connections, rather than feelings of isolation. O'Connor et al similarly observed an increase in self-reported loneliness in adults aged ≥60 years at two time points early in the pandemic but not in younger age groups,[64] while other studies have reported no change in loneliness over the course of the first pandemic wave.[26,65] As we move through the second pandemic wave, it will continue to be important to consistently measure how rates of loneliness change across different age groups to assess the longer-term effects of protracted physical distancing and stay-at-home measures. Such longitudinal studies will be vital to characterizing trajectories, identifying drivers of change and determining at-risk populations who could benefit from additional support, including young adults, who have reported among the highest levels of loneliness during this pandemic.[33,64,65]

Limitations

Our study leveraged a strong community-based partnership to obtain timely data from a large sample of older Canadians on the impacts of COVID-19 during the first wave but had several limitations. Given the cross-sectional study design, causation should not be inferred. Analyses were exploratory and intended to identify characteristics and circumstances associated with loneliness to help target supports to those who could benefit from them. The second limitation is that the data are based on a convenience sample of retired, educational staff, who are not fully representative of the Canadian population. The perspectives of vulnerable groups who may be at greater risk for loneliness (e.g. those with severe

mental health illness, low income, no home internet access, etc.) are likely underrepresented in this sample. As such, our findings may be a conservative estimate of loneliness. Finally, the measure of loneliness used in our study has not been validated; although, our findings support its criterion validity.

Conclusions

While many older adults reported feeling lonely during the first wave of COVID-19, several characteristics – in particular being female and living alone – increased the odds of loneliness. These characteristics may help guide targeting interventions to reduce loneliness as the pandemic persists.

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Competing interests

None declared

Author Contributions

RDS, PAR and JG conceived of the study and its design. RDS took the lead in the planning of the study and in writing the manuscript. JL, AL, and JG contributed to data collection by creating, pre-testing and administering the survey. WW performed the statistical analysis. RDS, SEB, SAC, JG, AG, CR, NMS, and PAR contributed to the content of the survey instrument. All authors contributed to the interpretation of the results and critically revised the final manuscript.

Data Availability

Data are available upon reasonable request.

Role of the Funder/Sponsor

Study funders/sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; nor the decision to submit the manuscript for publication.

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Table 1. Sociodemographic characteristics of older female and male survey respondents.

Characteristics	All (N=4,879)[a]	Women (n=3,421)	Men (n=1,397)
Language of Survey			
English	4762 (97.6%)	3339 (97.6%)	1365 (97.7%)
French	117 (2.4%)	82 (2.4%)	32 (2.3%)
Age, years	n=4,863	n=3,416	n=1,395
<65	1027 (21.1%)	846 (24.8%)	174 (12.5%)
65-79	3279 (67.4%)	2295 (67.2%)	945 (67.7%)
80+	557 (11.5%)	275 (8.1%)	276 (19.8%)
Living arrangement	n=4,762	n=3,356	n=1,351
Lives alone	1415 (29.7%)	1138 (33.9%)	266 (19.7%)
Access to private outdoor space	n=4,854	n=3,407	n=1,391
Yes	4706 (97.0%)	3302 (96.9%)	1350 (97.1%)
Ethnicity	n=4,861	n=3,410	n=1,397
White/Caucasian	4454 (91.6%)	3153 (92.5%)	1264 (90.5%)
Black/African Canadian	19 (0.4%)	15 (0.4%)	≤5
Chinese	19 (0.4%)	14 (0.4%)	≤5
Indigenous	11 (0.2%)	7 (0.2%)	≤5
South Asian (Indian, Sri Lankan, etc.)	17 (0.3%)	7 (0.2%)	9 (0.6%)
Southeast Asian (Japanese, Vietnamese, Korean, Cambodian, etc.)	14 (0.3%)	11 (0.3%)	≤5
West Asian (Arabian, Egyptian, Iranian, Afghan, etc.)	10 (0.2%)	7 (0.2%)	≤5
Other/Prefer to not say or self-identify	317 (6.5%)	196 (5.7%)	106 (7.6%)
Language spoken most often at home	n=4,855	n=3,411	n=1,388
English	4627 (95.3%)	3251 (95.3%)	1327 (95.6%)
French	165 (3.4%)	120 (3.5%)	41 (3.0%)
Other	63 (1.3%)	40 (1.2%)	20 (1.4%)
Self-reported health status	n=4,873	n=3,417	n=1,397
Excellent/very good/good	4370 (89.7%)	3082 (90.2%)	1238 (88.6%)
Fair/poor	492 (10.1%)	330 (9.7%)	154 (11.0%)
Don't Know	11 (0.2%)	5 (0.2%)	5 (0.4%)
Location of residence[b]	n=4,752	n=3,348	n=1,354
Urban	3962 (83.4%)	2791 (83.4%)	1132 (83.6%)
Rural	751 (15.8%)	531 (15.9%)	209 (15.4%)
Outside Canada	39 (0.8%)	26 (0.8%)	13 (1.0%)

[a] 61 respondents did not identify their gender

[b] 4405 (92.7%) respondents resided in Ontario and 308 (6.5%) in another Canadian province or territory.

Table 2. Loneliness and social connection in a sample of older Canadians, May 2020.

	All (N=4,879)[a]	Women (N=3,421)	Men (N=1,397)	P-value
Self-reported loneliness in past seven days	n=4,840	n=3,398	n=1,383	
Did not feel lonely	2675 (55.3%)	1684 (49.6%)	958 (69.3%)	<0.001
Lonely some of the time	1684 (34.8%)	1360 (40.0%)	307 (22.2%)	
Lonely always or often	404 (8.3%)	315 (9.3%)	83 (6.0%)	
Don't know	77 (1.6%)	39 (1.1%)	35 (2.5%)	
Strategies used to avoid feeling lonely [b]				
Connect with a friend or family member	3841 (78.7%)	2808 (82.1%)	988 (70.7%)	<0.001
Get fresh air	3134 (64.2%)	2235 (65.3%)	865 (61.9%)	0.025
Stay busy with work or projects	1855 (38.0%)	1275 (37.3%)	563 (40.3%)	0.049
Get active	1632 (33.5%)	1137 (33.2%)	470 (33.6%)	0.785
Try to get proper rest and sleep	1221 (25.0%)	806 (23.6%)	397 (28.4%)	<0.001
Engage in a hobby	1012 (20.7%)	704 (20.6%)	297 (21.3%)	0.597
Spend time with my pet	612 (12.5%)	473 (13.8%)	129 (9.2%)	<0.001
Other	347 (7.1%)	248 (7.3%)	95 (6.8%)	0.582
Frequency of speaking with a friend, family member or neighbour	n=4,865	n=3,412	n=1394	
Not at all	18 (0.4%)	4 (0.1%)	13 (0.9%)	<0.001
1-4 times	1401 (28.8%)	845 (24.8%)	535 (38.4%)	
5-7 times	3446 (70.8%)	2563 (75.1%)	846 (60.7%)	
Uses social networking websites or apps to communicate with friends and family	n=4,868	n=3,418	n=1394	
Yes	4113 (84.5%)	2983 (87.3%)	1090 (78.2%)	<0.001
No	751 (15.4%)	434 (12.7%)	301 (21.6%)	
Don't know	4 (0.1%)	1 (0.0%)	3 (0.2%)	

Table 2.Loneliness and social connection in a sample of older Canadians, May 2020 (Continued)

	All (N=4,879)[a]	Women (N=3,421)	Men (N=1,397)	P-value
Apps used [b]				
Facebook	3031 (62.1%)	2235 (65.3%)	768 (55.0%)	<0.001
Zoom	2558 (52.4%)	1918 (56.1%)	617 (44.2%)	<0.001
FaceTime	2444 (50.1%)	1874 (54.8%)	546 (39.1%)	<0.001
WhatsApp	1182 (24.2%)	931 (27.2%)	239 (17.1%)	<0.001
Instagram	1125 (23.1%)	914 (26.7%)	201 (14.4%)	<0.001
Skype	772 (15.8%)	523 (15.3%)	244 (17.5%)	0.061
Twitter	575 (11.8%)	429 (12.5%)	141 (10.1%)	0.017
Google Hangouts/Meet	322 (6.6%)	255 (7.5%)	64 (4.6%)	<0.001
Houseparty	212 (4.4%)	178 (5.2%)	34 (2.4%)	<0.001
Other	368 (7.5%)	275 (8.0%)	89 (6.4%)	0.047
Devices used [b]				
Smartphone	3026 (62.0%)	2204 (64.4%)	791 (56.6%)	<0.001
Desktop/laptop	2579 (52.9%)	1704 (49.8%)	846 (60.6%)	<0.001
Landline telephone	2528 (51.8%)	1776 (51.9%)	714 (51.1%)	0.612
Tablet	2283 (46.8%)	1659 (48.5%)	594 (42.5%)	<0.001
Other	172 (3.5%)	136 (4.0%)	33 (2.4%)	0.006

[a] 61 respondents did not identify their gender

[b] categories not mutually exclusive

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020.

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Sociodemographic characteristics						
Age, years						
<65 (ref)	440 (52.8)	--	--	65 (38.5)	--	--
65-79	1110 (49.3)	0.87 (0.74-1.02)	0.84 (0.72-0.99)	248 (27.1)	0.59 (0.42-0.84)	0.56 (0.39-0.78)
80+	125 (46.3)	0.77 (0.59-1.01)	0.70 (0.53-0.92)	77 (29.5)	0.67 (0.45-1.01)	0.61 (0.40-0.92)
Living arrangement						
Lives with others (ref)	935 (43.0)	--	--	242 (23.0)	--	--
Lives alone	714 (63.6)	2.32 (2.00-2.67)	2.50 (2.14-2.92)	137 (54.2)	3.95 (2.97-5.26)	3.86 (2.88-5.18)
Ethnicity						
White (ref)	1565 (50.5)	--	--	357 (29.2)	--	--
Non-White	77 (41.6)	0.70 (0.52-0.94)	0.70(0.51-0.95)	19 (26.4)	0.87(0.51-1.49)	0.83(0.48-1.43)
Residence of location						
Urban (ref)	1378 (50.4)	--	--	312 (28.5)	--	--
Rural	256 (48.7)	0.94 (0.78-1.13)	0.93 (0.77-1.13)	58 (29.2)	1.03 (0.74-1.44)	1.09 (0.78-1.54)
Health status						
Good (ref)	1456 (48.1)	--	--	324 (27.0)	--	--
Fair/Poor	216 (66.9)	2.18 (1.71-2.78)	2.24 (1.76-2.86)*	65 (45.1)	2.22(1.56-3.16)	2.34 (1.64-3.34)[a]
Caregiver to another person						
No (ref)	1198 (49.4)	--	--	304 (28.5)	--	--
Yes	469 (51.0)	1.07 (0.92-1.25)	1.05 (0.90-1.23)	83 (30.1)	1.08 (0.81-1.44)	1.03 (0.77-1.39)
Receives care						
No (ref)	1447 (48.5)	--	--	319 (27.5)	--	--
Yes	220 (61.1)	1.67 (1.33-2.09)	1.55 (1.23-1.97)	68 (37.6)	1.59(1.15-2.20)	1.39 (0.97-2.00)

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020 (Continued).

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Social Support						
Social media use						
No (ref)	213 (50.1)	--	--	91 (31.5)	--	--
Yes	1458 (49.8)	0.99(0.80-1.21)	1.00 (0.81-1.23)	299 (28.4)	0.86(0.65-1.14)	0.90 (0.68-1.20)
Communication frequency[b]						
None or low (ref)	120 (68.6)	--	--	55 (36.9)	--	--
High	1551 (48.9)	0.44 (0.32-0.61)	0.47 (0.34-0.66)	334 (27.9)	0.66 (0.46-0.95)	0.74 (0.61-1.06)
Received offers of assistance[c]						
No (ref)	1016 (52.5)	--	--	253 (28.7)	--	--
Yes	650 (46.3)	0.78 (0.68-0.90)	0.79 (0.69-0.91)	136 (29.5)	1.04 (0.81-1.33)	1.05 (0.82-1.36)
Attitudes and behaviours towards COVID-19						
Concern for pandemic						
Low level (ref)	260 (42.1)	--	--	62 (19.8)	--	--
High level	1407 (51.6)	1.47 (1.23-1.75)	1.46 (1.22-1.74)	328 (31.8)	1.90 (1.40-2.58)	1.86 (1.36-2.53)
Extent practising physical distancing						
None/some (ref)	155 (47.3)	--	--	40 (22.5)	--	--
Most of time	1231 (49.9)	1.11(0.88-1.40)	1.06 (0.84-1.34)	295 (29.9)	1.47(1.01-2.15)	1.41 (0.96-2.07)
All of time	283 (51.4)	1.18 (0.90-1.55)	1.06(0.80-1.40)	55 (30.7)	1.53 (0.95-2.46)	1.31 (0.80-2.14)
No perceived positive effects of distancing						
No (ref)	1331 (46.7)	--	--	306 (27.5)	--	--
Yes	344 (67.3)	2.35(1.92-2.86)	2.25 (1.84-2.75)	84 (35.9)	1.48(1.10-1.99)	1.44 (1.06-1.95)

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020 (Continued).

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Change in daily routine						
No (ref)	46 (34.9)	--	--	6 (8.2)	--	--
Yes	1623 (50.4)	1.90 (1.32-2.74)	2.02 (1.39-2.92)	383 (30.2)	4.83(2.08-11.24)	5.57(2.37-13.11)

[a] Adjusted for age group only.
[b] Self-reported communication with friends, family members or neighbours.
[c] Reported receiving offers of assistance from their community to help with daily life during COVID-19 distancing measures.

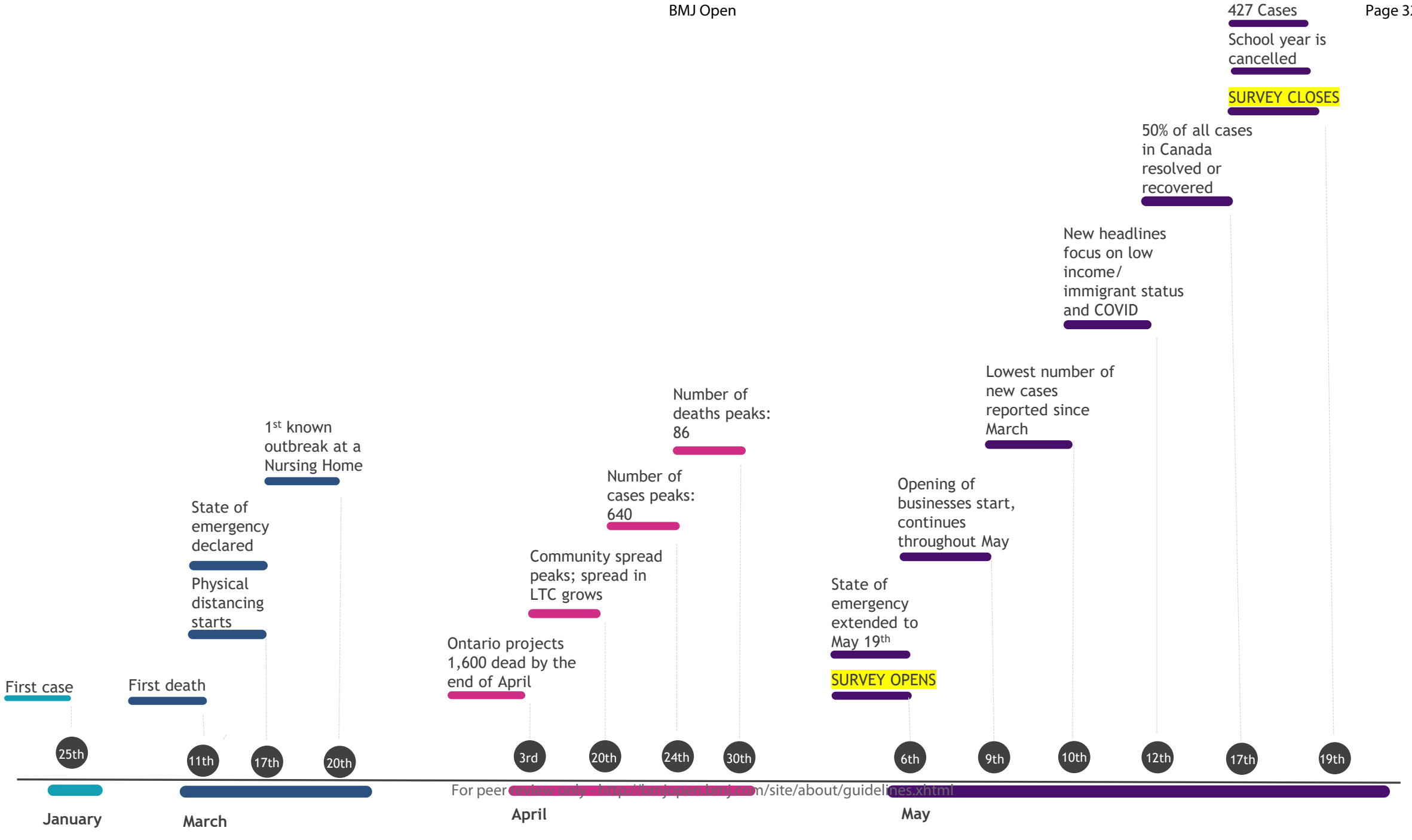
Table 4. Odds ratios (OR) for loneliness (sex-pooled) in a sample of older Canadians, May 2020.

	All respondents			
	Unadjusted OR (95% CI)	Age- & sex-Adjusted OR (95% CI)	Age-, sex-, & health status-Adjusted OR (95% CI)	Fully[a] adjusted OR (95% CI)
Sociodemographic				
Female sex (ref male)	2.44 (2.13-2.80)	2.38 (2.07-2.73)	2.41 (2.09-2.77)	
Women living alone				1.52 (1.13-2.04)
Women living with others				2.44 (2.04-2.92)
Age, years				
65-79 (ref <65)	0.74 (0.64-0.86)	0.81 (0.70-0.94)	0.78 (0.67-0.90)	0.69 (0.59-0.81)
80+ (ref <65)	0.61 (0.49-0.75)	0.79 (0.63-0.98)	0.72 (0.57-0.90)	0.50 (0.39-0.65)
Living alone	2.83 (2.49-3.22)	2.78 (2.42-3.18)	2.74 (2.39-3.15)	
Living alone in women				2.65 (2.26-3.11)
Living alone in men				4.26 (3.15-5.76)
Non-white ethnicity	0.75 (0.58-0.97)	0.74 (0.57-0.96)	0.72 (0.55-0.94)	0.71 (0.54-0.94)
Rural	0.98 (0.83-1.15)	0.95 (0.81-1.12)	0.96 (0.82-1.13)	1.07 (0.90-1.27)
Fair or poor health status	2.14 (1.76-2.60)	2.25 (1.84-2.76)	--	1.93 (1.54-2.41)
Caregiver to another person	1.14 (1.00-1.30)	1.04 (0.91-1.20)	1.05 (0.91-1.20)	1.18 (1.02-1.37)
Receives care	1.54 (1.29-1.84)	1.76 (1.45-2.12)	1.50 (1.24-1.83)	1.47 (1.19-1.81)
Social support				
Social media use	1.08 (0.92-1.26)	0.93 (0.78-1.09)	0.96 (0.81-1.14)	1.13 (0.94-1.36)
High communication frequency	0.65 (0.52-0.81)	0.53 (0.42-0.68)	0.57 (0.45-0.72)	0.55 (0.43-0.72)
Received offers of assistance	0.89 (0.79-1.00)	0.85 (0.75-0.96)	0.85 (0.75-0.96)	0.79 (0.69-0.90)
Attitudes and behaviours towards COVID-19				
High concern for pandemic	1.65 (1.42-1.91)	1.59 (1.37-1.86)	1.56 (1.33-1.82)	1.55 (1.31-1.84)
Extent practising distancing				
Most of time (ref none/some)	1.27 (1.05-1.53)	1.19 (0.98-1.45)	1.15 (0.95-1.40)	1.23 (0.99-1.53)
All of time (ref none/some)	1.39 (1.11-1.75)	1.29 (1.02-1.64)	1.13 (0.89-1.44)	1.12 (0.86-1.45)
No perceived positive effects of pandemic distancing measures	1.90 (1.62-2.22)	2.07 (1.76-2.43)	1.97 (1.67-2.32)	1.94 (1.62-2.32)
Reported change in routine	2.36 (1.72-3.24)	2.30 (1.67-3.19)	2.50 (1.80-3.48)	2.81 (1.96-4.03)

[a] Adjusted for all covariates listed in the table with an interaction term for sex and living alone (P-value =0.006).

Figure 1. Timeline of COVID-19 in Ontario, Canada's largest province.

Physical distancing measures beginning March 17 included closure of all indoor recreational facilities, public libraries, theatres, cinemas, bars, and restaurants. Publicly funded schools were closed by this point as well, and all employers in Ontario were asked to facilitate virtual work arrangements for employees. Remaining non-essential businesses were closed March 25. Gatherings of more than 5 people were prohibited on March 28. On March 30, Ontario's Chief Medical Officer of Health strongly recommended individuals over 70 years of age or those with compromised immune systems or underlying medical conditions to stay at home. Source: CIHI, COVID-19 Intervention Scan, Accessed Aug 11 2020, https://www.cihi.ca/en/covid-19-intervention-scan



Supplement. Loneliness among older adults in the community during COVID-19

eAppendix. Questionnaire

The Impact of COVID-19 Physical Distancing Measures on Older Canadians and Strategies to Address Unmet Needs: A Survey of Retired Educators

Introduction

Welcome! Thank you for agreeing to participate in this survey. We value your opinions and we appreciate your participation in this process.

The Study Information Sheet will answer many of your questions and reviews your rights and responsibilities as a participant in this research project. You can access the Study Information Sheet by clicking this link. You may print a copy of the Study Information Sheet for your records.

If you have additional questions, please contact Joyce Li, Research Coordinator (joyce.li@wchospital.ca) before continuing further.

Electronic Consent

Please select your choice below. Clicking on the "Agree" button indicates your confirmation that:

This research study has been fully explained to me and all of my questions answered to my satisfaction
I understand the requirements of participating in this research study
I have been informed of the risks and benefits, if any, of participating in this research study
I have been informed of any alternatives to participating in this research study
I have been informed of the rights of research participants
I have read each page of the Study Information Sheet
I have agreed to participate in this research study

Electronic Consent

- ○ Agree
- ○ Disagree

The Coronavirus pandemic (COVID-19) is impacting all Canadians but older adults are experiencing its impacts in unique ways. This survey will help us understand if and how COVID-19 is affecting your health, as well your social circumstances and supports you have available. This information will be used by researchers at Women's College Hospital as well as RTOERO leadership to develop supports for older adults and for our members during and after the COVID-19 pandemic. The survey is anonymous and will take about 10-20 minutes to complete.

A) Daily life during COVID-19

1. To what extent would you agree with the following statement: The Covid-19 crisis has changed my daily routine.

- ○ Strongly Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ○ Strongly Disagree

○ Don't know

Comment:

2. How are you spending your time now? Select all that apply.

□ Watching more TV
□ More time on my hobbies
□ COVID-19-related community work (making masks, grocery shopping, meal or supply drop-offs, etc)
□ Working from home
□ Going on walks
□ More time exercising
□ More time cooking or baking
□ More time making or taking phone calls from friends/relatives
□ More time on the internet and social media
□ I am not spending my time differently than before COVID-19
□ Other, please specify:

3. Have you experienced any of the following difficulties due to COVID-19? Please select all that apply.

□ Getting/ordering groceries
□ Getting supplies (e.g. toilet paper, hand sanitizer, cleaning products, bleach, etc.)
□ Getting prescription medications
□ Accessing healthcare
□ Changes to planned health treatments (e.g. cancer treatment, outpatient procedure, surgery, etc).
Please Specify:
□ Other, please describe:
□ I have not experienced any difficulties

4. Although this is a challenging time, have you experienced any positive effects or 'silver linings' during this crisis? Please select all that apply.

□ Stronger sense of community
□ Feeling more connected to partner, family and friends
□ A growing respect for older adults and their needs by society (e.g. designated grocery shopping hours)
□ Slower pace of life / more time to relax or rest
□ No or less time spent commuting to work
□ Improved access to healthcare through virtual care
□ Other, please describe:
□ I have not experienced any positive effects of this crisis

Comment:

5. How concerned are you about the COVID-19 pandemic?

○ Extremely concerned
○ Very concerned
○ Moderately concerned
○ Slightly concerned
○ Not at all concerned

6. To what extent are you practising physical distancing?

- ○ All of the time. I am staying home all of the time.
- ○ Most of the time. I only leave my home to buy essentials or for necessary medical appointments.
- ○ Some of the time. I have reduced the amount of time I spend in public.
- ○ None of the time. I am doing everything that I normally do.

7. The COVID-19 pandemic and physical distancing measures have created new or additional concerns for many people. Select your top three concerns.

- □ Getting sick from COVID-19
- □ A loved one getting sick from COVID-19
- □ The health system becoming overloaded (not enough hospital beds or supplies)
- □ Not being able to meet basic needs (put food on the table or pay bills)
- □ Feeling lonely, anxious or depressed
- □ Limited access to routine healthcare
- □ Not being able to adequately take care of my health
- □ Not being able to adequately care for loved ones
- □ Not being able to visit loved ones in long-term care
- □ Family stress from confinement
- □ Unwittingly spreading COVID-19 (if sick without symptoms)
- □ My children or grandchildren's education or work
- □ Economic recession and retirement savings
- □ Other – please indicate:

8. In the past 4 weeks, have you been in close contact with a person who has tested positive for COVID-19?

- ○ Yes
- ○ No
- ○ Don't know

9. In the past 4 weeks, have you been ill with a cold or flu-like illness?

- ○ Yes
- ○ No
- ○ Don't know

10. Have you been tested for COVID-19?

- ○ Yes, I was tested and was positive
- ○ Yes, I was tested and was negative
- ○ No, I tried to get tested but could not get a test
- ○ No, I have not tried to get tested

B) Caregiving and receiving care

11. Do you provide assistance to another person because of a health condition or limitation? By assistance we mean personal care, medical treatments, scheduling or coordinating care-related tasks, meal preparation, house maintenance, transportation, social or emotional support, mobility, or financial assistance or management. Please exclude any assistance you provided as part of a volunteer organization or paid job.

- ○ Yes
- ○ No

- Don't Know

Do you live in the same household as this person?

- Yes
- No
- Don't Know

Has the COVID-19 crisis impacted your ability to give care? In what way?

- Yes, please specify:
- No
- Don't know

Comment:

12. Do you receive assistance from family, friends, or neighbours because of a health condition or limitation that affects your daily activities?

- Yes
- No
- Don't Know

Does your caregiver live in the same household as you?

- Yes
- No
- Don't Know

Has the COVID-19 crisis impacted your ability to receive care? In what way?

- Yes, please specify:
- No
- Don't know

C) Social connections during COVID-19

To reduce the spread of COVID-19, the government and public health officials have asked Canadians to practise physical distancing (i.e. minimizing close contact with others). While physical distancing is necessary to slow the spread of disease, it may lead to loneliness, anxiety or depression.

13. In the past seven days, which statement best applies?

- I did not feel lonely.
- I felt lonely one or two days.
- I felt lonely several days.
- I felt lonely most days.
- I felt lonely every day.
- Don't know.

Comment:

14. What steps do you take to avoid feeling lonely? Please select up to three strategies you use most often.

□ Connect with a friend or family member
□ Get fresh air
□ Get active
□ Stay busy with work or projects
□ Engage in a hobby
□ Try to get proper rest and sleep
□ Spend time with my pet
□ Other, please share any strategies:
□ Please share with us any specific resources you use to avoid feeling lonely (e.g., participating in a virtual book club):

15. In the past seven days, how often did you speak with a friend, family member or neighbour?

○ Not at all
○ 1-2 times
○ Several times (3-4 times)
○ Almost every day (5-6 times)
○ Every day (7 times)

D) Use of technology to stay socially connected

Digital technologies can help us stay socially connected as we practise physical distancing.

16. Do you have access to the Internet at home?

○ Yes
○ No
○ Don't Know

What are the reasons you do not have access to the internet at home? Select all that apply.

□ No need or no interest
□ Cost (service or equipment)
□ The available service does not meet our needs
□ Security or privacy concerns (e.g. viruses, use of personal information)
□ Lack of confidence, knowledge, or skills
□ No Internet-ready device (e.g. desktop computer) available in household
□ Other, please specify:

How would you rate the internet connection in your home?

○ Very good
○ Good
○ Moderate
○ Poor
○ Don't know

17. Do you have a smartphone that you use for personal use? A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded applications, e.g. Apple iPhone and Samsung Galaxy

○ Yes
○ No

○ Don't know

18. Do you use any social networking websites (e.g. Facebook) or apps (e.g. Zoom or FaceTime) to communicate with friends and family?

○ Yes
○ No
○ Don't know

Please check which sites or apps you use (check all that apply)

□ Facebook
□ Instagram
□ Twitter
□ WhatsApp Messenger
□ Zoom
□ Skype
□ Face Time
□ Houseparty
□ Google Hangouts/meet
□ Other, please specify:

19. What devices do you use most often when connecting with friends and family? Please select all that apply.

□ Desktop/Laptop
□ Tablet
□ Smartphone
□ Landline telephone
□ Other, please specify:

Comment:

E) Supporting older adults during the COVID-19

20. In your view, what are the most pressing needs of older adults during the COVID-19 pandemic? Please select up to 3 issues.

□ Support for caregivers
□ Access to (routine?) healthcare to maintain physical health
□ Resources or supports on how to stay physically healthy during the COVID-19
□ Resources or supports on how to stay mentally healthy during the COVID-19
□ Programs or supports to ensure basic needs are met (e.g. foodbanks, home meal delivery, income supplements, etc.)
□ Policies and procedures to ensure safety of older adults in long-term care
□ Strategies to ensure older adults are able to stay connected with loved ones in long-term care
□ Strategies to help older adults stay socially connected while physically distanced
□ Other, please specify:

Comment:

21. To what extent do you agree or disagree with the following statements?

	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
a. I have received offers of assistance from my community to help with daily life during stay at home and physical distancing measures.	○	○	○	○	○
b. Governments and policy makers care about the health and well-being of older adults.	○	○	○	○	○
c. The level of respect for older adults in society has decreased during the COVID-19 pandemic.	○	○	○	○	○
d. I have witnessed ageism in the daily news and popular culture during the COVID-19 pandemic.	○	○	○	○	○

Comment:

F) Sociodemographics

23. Your age

- ○ 54 or younger
- ○ 55-59
- ○ 60-64
- ○ 65-69
- ○ 70-74
- ○ 75-79
- ○ 80+

24. Your gender

- ○ Female
- ○ Male
- ○ Prefer to self identify
- ○ Prefer not to say

25. Including yourself, how many persons are living in your household?

26. Do you have access to private outdoor space (e.g. backyard, terrace or balcony)?

- ○ Yes
- ○ No
- ○ Don't Know

27. How would you describe your ethnic identity?

- ○ Black/African Canadian
- ○ Central/South American

- Chinese
- Filipino
- Indigenous
- South Asian (Indian, Sri Lankan, etc.)
- Southeast Asian (Japanese, Vietnamese, Korean, Cambodian, etc.)
- West Asian (Arabian, Egyptian, Iranian, Afghan, etc.)
- White/Caucasian (European, Russian, etc.)
- Other, please specify:
- Prefer to self-identify
- Prefer not to say

28. What language do you speak most often at home?

- English
- French
- Other, please indicate:

29. In general, would you say your health is... ?

- Excellent
- Very good
- Good
- Fair
- Poor
- Don't Know

30. What are the first 3 digits of your postal code?

G) Overall comments and suggestions

31. How can RTOERO and the Foundation support members during the COVID-19 pandemic?

32. Other comments or suggestions

You have opted not to consent to participate at this time. Thank you for considering the invitation to participate in this survey project.

eMethods. Exposure Variable Definitions

Sociodemographic	Definition
Sex	Based on self-identification as female or male.
Age	Categorized as <65 years if respondent's selected age was '54 or younger', '55-59', or '60-64'; as 65-79 years if they selected '65-69', '70-74' or '75-79'; and as 80+ if they selected '80+'.
Living arrangement	Classified as living alone if reported 1 person living in their household (i.e. themselves) and as living with others if reported >1 person living in their household.
Ethnicity	Classified as white if respondents identified themselves as 'White/Caucasian' or they identified as 'Other' but specified white, Caucasian, Hebrew/Jewish, or white European ethnicity, e.g. Italian, French, Irish, Greek, Welsh, Scottish, etc. Central/South American and Filipino were regrouped into the Other category due to small numbers.
Rural residence	Classified as rural if second digit of reported Canadian postal code was a '0', and outside Canada if no match to a Canadian postal code.[1]
Health status	Classified as 'fair or poor' based on self-reporting fair or poor health; and as 'good' if 'excellent', 'very good' or 'good' health was reported.
Caregiver	Classified as a caregiver if responded that they aid another person because of a health condition or limitation.
Care recipient	Classified as a care recipient if they reported receiving assistance from another person because of a health condition or limitation.
Social support	
Social media use	Classified as yes if respondent reported using any social networking websites (e.g. Facebook) or apps (e.g. Zoom or FaceTime) to communicate with friends and family.
Frequency of communication	Classified as 'high frequency' if reported speaking with a friend, family member or neighbour≥3 times in the prior week.
Receipt of offers of assistance	Classified as yes if respondent strongly or somewhat agreed to the statement "I have received offers of assistance from my community to help with daily life during stay at home and physical distancing measures."
Attitudes and behaviours towards COVID-19	
Level of concern	Classified as 'high concern' if respondent reported they were 'extremely' or 'very concerned' about the COVID-19 pandemic.
Extent practicing physical distancing	Classified as 'all of the time', 'most of the time' or 'some of the time or none' based on self-report.
Change in routine	Classified as yes if respondent strongly or somewhat agreed that the Covid-19 crisis changed their daily routine, and as no if respondent was neutral, or somewhat or strongly disagreed with the statement.

References

1. Statistics Canada. How Postal Codes Map to Geographic Areas. 2007. https://www150.statcan.gc.ca/n1/en/pub/92f0138m/92f0138m2007001-eng.pdf?st=VjySvIB3. Accessed June 30, 2020.

eTable 1. Impact of COVID-19 on daily life reported by a sample of older Canadians, May 2020

	All (N=4,879)[a]	Female (N=3,421)	Male (N=1,397)	P-Value
The COVID-19 crisis has changed my daily routine	n=4,863	n=3,412	n=1,390	
Strongly Agree	3211 (66.0%)	2304 (67.5%)	878 (63.2%)	0.0047
Somewhat Agree	1438 (29.6%)	973 (28.5%)	436 (31.4%)	
Neutral	91 (1.9%)	56 (1.6%)	35 (2.5%)	
Somewhat Disagree	87 (1.8%)	60 (1.8%)	25 (1.8%)	
Strongly Disagree	35 (0.7%)	18 (0.5%)	16 (1.2%)	
Don't know	1 (0.0%)	1 (0.0%)	0	
How time is being spent [b]				
More time on the internet and social media	3584 (73.5%)	2562 (74.9%)	978 (70.0%)	0.0005
Going on walks	3128 (64.1%)	2260 (66.1%)	835 (59.8%)	<0.0001
Watching more TV	2877 (59.0%)	2039 (59.6%)	805 (57.6%)	0.2050
More time making or taking phone calls from friends/relatives	2593 (53.2%)	2026 (59.2%)	543 (38.9%)	<0.0001
More time cooking or baking	2517 (51.6%)	2001 (58.5%)	489 (35.0%)	<0.0001
More time on my hobbies	2073 (42.5%)	1527 (44.6%)	518 (37.1%)	<0.0001
More time exercising	1111 (22.8%)	780 (22.8%)	320 (22.9%)	0.9367
COVID-19-related community work	592 (12.1%)	500 (14.6%)	83 (5.9%)	<0.0001
Working from home	431 (8.8%)	291 (8.5%)	136 (9.7%)	0.1733
Other	987 (20.2%)	691 (20.2%)	283 (20.3%)	0.9631
Cleaning, home renovations, gardening, organizing/decluttering	308 (6.3%)			
Reading	198 (4.1%)			
Not spending my time differently than before COVID-19	179 (3.7%)	89 (2.6%)	86 (6.2%)	<0.0001
Difficulties experienced [b]				
Getting supplies (e.g. toilet paper, hand sanitizer, cleaning products, bleach, etc.)	2029 (41.6%)	1471 (43.0%)	528 (37.8%)	0.0009
Getting/ordering groceries	1611 (33.0%)	1130 (33.0%)	459 (32.9%)	0.9066
Changes to planned health treatments (e.g. cancer treatment, outpatient procedure, surgery, etc).	1296 (26.6%)	890 (26.0%)	388 (27.8%)	0.2098
Accessing healthcare	1040 (21.3%)	697 (20.4%)	326 (23.3%)	0.0226
Getting prescription medications	687 (14.1%)	448 (13.1%)	230 (16.5%)	0.0023
Other	776 (15.9%)	602 (17.6%)	171 (12.2%)	<0.0001
Prescription, medications on backorder	40 (0.8%)			
No difficulties experienced	1353 (27.7%)	939 (27.5%)	398 (28.5%)	0.4638

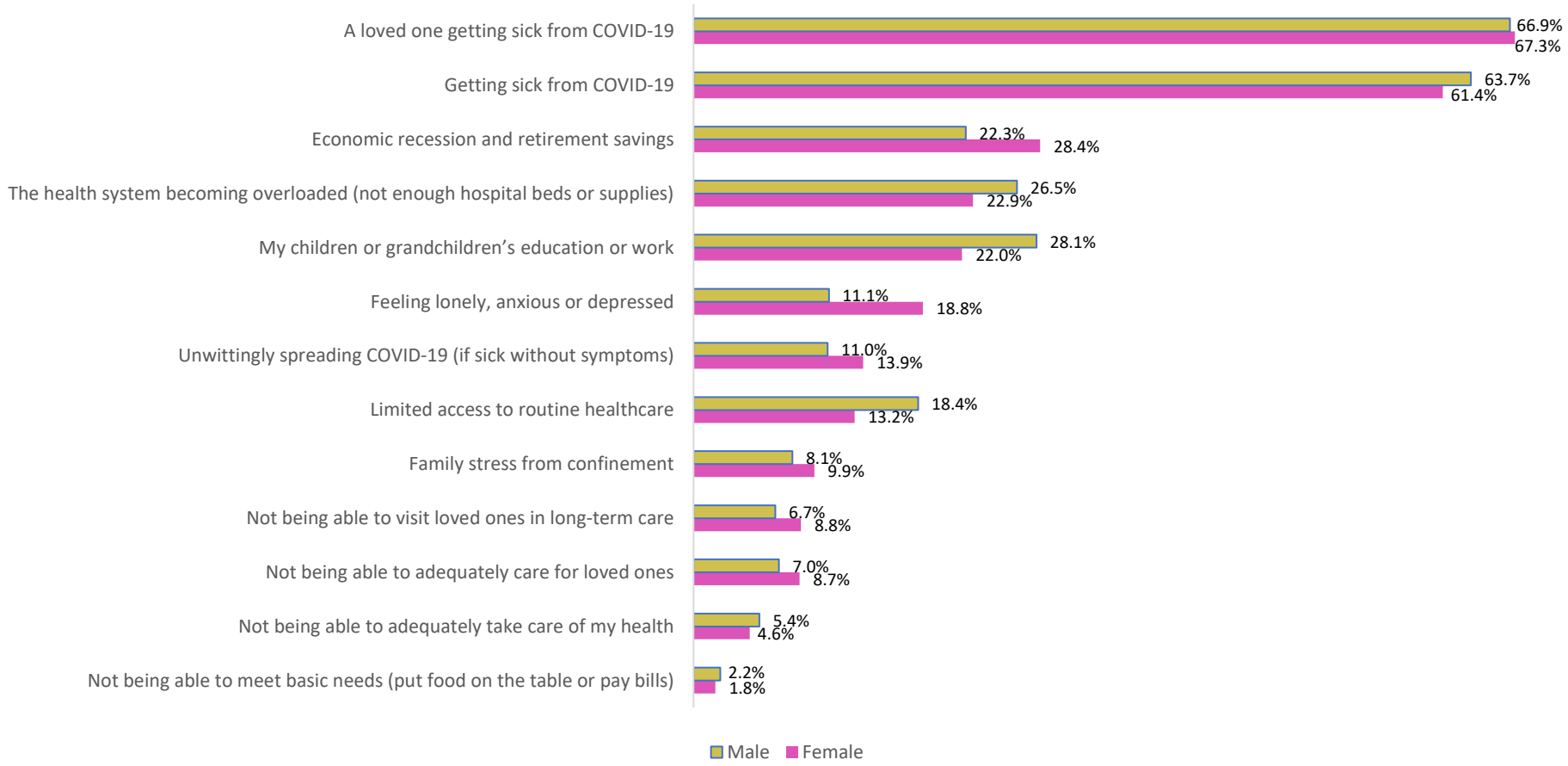
eTable 1. Impact of COVID-19 on daily life reported by a sample of older Canadians, May 2020 (Continued)

	All (N=4,879)[a]	Female (N=3,421)	Male (N=1,397)	P-Value
Positive effects experienced [b]				
Slower pace of life / more time to relax or rest	2583 (52.9%)	1879 (54.9%)	673 (48.2%)	<0.0001
Feeling more connected to partner, family and friends	2062 (42.3%)	1405 (41.1%)	629 (45.0%)	0.0117
A growing respect for older adults and their needs by society	1778 (36.4%)	1279 (37.4%)	473 (33.9%)	0.0209
Stronger sense of community	1571 (32.2%)	1129 (33.0%)	429 (30.7%)	0.1225
No or less time spent commuting to work	341 (7.0%)	240 (7.0%)	96 (6.9%)	0.8590
Improved access to healthcare through virtual care	190 (3.9%)	143 (4.2%)	47 (3.4%)	0.1868
Other	492 (10.1%)	374 (10.9%)	113 (8.1%)	0.0030
None experienced	778 (16.0%)	519 (15.2%)	246 (17.6%)	0.0356

[a] 61 respondents did not identify their gender

[b] categories not mutually exclusive

eFigure 1. Top new or additional concerns related to COVID-19 and physical distancing measures reported by survey respondents, May 2020.



Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Checklist Item	***Explanation***	***Page Number***
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	5
IRB approval	Mention whether the study has been approved by an IRB.	6
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	6
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	7
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	6-7
Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	5
Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	5
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	5
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	5
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	NA
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	6
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	6

Time/Date	In what timeframe were the data collected?	5
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	NA
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	7
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	NA
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	NA
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.	NA
Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	NA
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	NA
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	NA
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate.	NA
Completion rate (Ratio of users who finished the survey/users who	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a measure for how completely	7

agreed to participate)	questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)	
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	NA
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	8
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	NA
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	NA

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Loneliness among older adults in the community during COVID-19: a cross-sectional survey in Canada

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Word count: 3,686

Abstract

Objective: Physical distancing and stay-at-home measures implemented to slow transmission of novel coronavirus disease (COVID-19) may intensify feelings of loneliness in older adults, especially those living alone. Our aim was to characterize the extent of loneliness during the first wave in a sample of older adults living in the community and assess characteristics associated with loneliness.

Design: Online cross-sectional survey between May 6 - 19, 2020

Setting: Ontario, Canada

Participants: Convenience sample of members of a national retired educators' organization.

Primary outcome measures: Self-reported loneliness, including differences between women and men.

Results: 4879 respondents (71.0% women; 67.4% 65-79 years) reported that in the preceding week, 43.1% felt lonely at least some of the time, including 8.3% that felt lonely always or often. Women had increased odds of loneliness compared to men, whether living alone (adjusted Odds Ratio (aOR) 1.52 [95% Confidence Interval (CI) 1.13-2.04]) or with others (2.44 [95% CI 2.04-2.92]). Increasing age group decreased the odds of loneliness (aOR 0.69 [95% CI 0.59-0.81] 65-79 years and 0.50 [95% CI 0.39-0.65] 80+ years compared to <65 years). Living alone was associated with loneliness, with a greater association in men (aOR 4.26 [95% CI 3.15-5.76]) than women (aOR 2.65 [95% CI 2.26-3.11]). Other factors associated with loneliness included: fair or poor health (aOR 1.93 [95% CI 1.54-2.41]), being a caregiver (aOR 1.18 [95% CI 1.02-1.37]), receiving care (aOR 1.47 [95% CI 1.19-1.81]), high concern for the pandemic (aOR 1.55 [95% CI 1.31-1.84]), not experiencing positive effects of pandemic distancing measures (aOR 1.94 [95% CI 1.62-2.32]), and changes to daily routine (aOR 2.81 [95% CI 1.96-4.03]).

Conclusions: While many older adults reported feeling lonely during COVID-19, several characteristics – such as being female and living alone – increased the odds of loneliness. These characteristics may help identify priorities for targeting interventions to reduce loneliness.

Strengths and limitations of this study

- The study leveraged a strong community-based partnership to obtain timely data from a large sample of older Canadians on the impacts of the first wave of COVID-19.
- The study evaluated the association between sociodemographic characteristics, social support, and COVID-19 related attitudes and behaviours, and loneliness, stratified by sex and overall. The data were based on a convenience sample of retired, educational staff, who are not fully representative of the Canadian population.
- The perspectives of vulnerable groups who may be at greater risk for loneliness (e.g. those with severe mental health illness, low income, no home internet access, etc.) are likely underrepresented in this sample.

Background

As data emerge on how common, yet harmful, it is to be lonely, loneliness is increasingly recognized as a public health priority. In the United States, more than 40% of respondents to the nationally representative Health and Retirement Study reported feeling lonely.[1] In Canada, 1 in 4 older women and 1 in 5 older men report feeling lonely at least some of the time.[2] While feelings of loneliness can occur at any age, research has shown that rates of loneliness follow a nonlinear U-shaped distribution, with the highest levels reported in young (<25 years) and older (>65 years) adults.[3] While predisposing factors differ by life stage, older adults are at increased risk because they are more likely to experience events such as retirement, chronic illness, widowhood, and living alone.[4] Women report higher rates of loneliness than men,[2,4] possibly due to their longer life expectancy and greater likelihood of outliving their spouse, resulting in prolonged widowhood,[5,6] their caregiver roles,[2,7,8] lower incomes[9], and their greater tendency to acknowledge feeling lonely.[6] Addressing loneliness is important because of its profound impact on health and well-being, including increased risk for premature death,[10,11] cardiovascular disease, depression, dementia and even suicide.[12-18]

The novel coronavirus pandemic (COVID-19) and accompanying physical distancing and stay-at-home measures (i.e. closure of nonessential businesses and public spaces, as well as recommendations to practice physical distancing with anyone outside the home) are expected to intensify feelings of loneliness. Previous infectious disease outbreaks and pandemics have demonstrated increases in loneliness, anxiety, and depression from quarantine-induced social isolation.[19,20] Emerging research from the early stages of the COVID-19 pandemic support this hypothesis[21], with several studies demonstrating elevated rates of loneliness[22-24], psychological distress[25,26], and anxiety, depression and stress[27,28] during lock-down periods.

Understanding how older adults have been impacted by COVID-19 is vital to address their needs promptly and effectively and prevent unnecessary harms as the pandemic persists. Cross-sectional studies published as early as April 2020 examined public concerns regarding COVID-19 (e.g. becoming infected, reduced health care access) and its impact on daily life.[29,30] While valuable, these studies were conducted prior to or on the cusp of the implementation of physical distancing and stay-at-home measures, did not report on mental health, under-represented older adults[29], a key high-risk group, and did not explore important differences between women and men. More recently, McGinty et al published prevalence estimates of psychological distress and loneliness in the US; although, subgroup analyses focused on psychological distress rather than loneliness.[25]

More data on loneliness in older adults during COVID-19 continues to emerge as the pandemic unfolds[24,31-34], yet important knowledge gaps remain. A key gap is whether older women and men have shared, or unique, risk factors for loneliness during the pandemic. Pre-COVID-19, it has been shown that while there are common contributors to loneliness in older adults, like widowhood or declining health, some risk factors affect the sexes differently. For example, mobility problems have been shown to be a strong predictor of loneliness in women, while a reduced social network strongly predicts loneliness in men.[35] There is also comparatively little data on the relationship between COVID-19-specific factors (e.g. level of concern, impact to daily life, COVID-19 infection, etc)[22,24,32] and behaviours (e.g. use of technology for social connection) with loneliness in general, but particularly in older adults. Timely data relevant to older women and men are needed to inform public health responses and healthcare delivery.

We conducted an online cross-sectional survey to assess how the first wave of the COVID-19 pandemic affected older adults living in the community in Canada. Our objective was to characterize the extent of

loneliness in older adults, including differences between women and men, and examine factors associated with loneliness to identify groups likely to benefit most from intervention. We hypothesized that loneliness would be common, particularly in women and those living alone, and that higher pandemic concern would increase loneliness.

Methods

Study design and setting

A closed, online cross-sectional survey was administered to members of the RTOERO (formerly known as the Retired Teachers of Ontario) between May 6 and May 19, 2020. At this time in Ontario, Canada, physical distancing measures (e.g. lockdown) had been in place for about seven weeks; daily case and death counts were in decline after peaks in late April; and outbreaks in long-term care homes were a focus of news headlines (**Figure 1** for timeline).

RTOERO is a voluntary membership organization of more than 81,000 retired educators, administrators, and educational support staff, from child care, K-12 and post-secondary settings, that provides group health insurance benefits, as well as other programs and services, to the broader education community (https://www.rtoero.ca). Members were invited to participate by e-mail from RTOERO's chief executive officer. Two reminder emails were sent at 7 and 10 days. The survey was not publicly advertised. All members were eligible to participate if they had a registered e-mail address (~62,000). Study materials were provided in English and French. Our study design and reporting followed the Checklist for Reporting Results of Internet E-Surveys (CHERRIES).[36]

The Research Ethics Board at Women's College Hospital in Toronto, Canada approved this study [#2020-0051-E]. A link to a study information sheet was provided on the survey's home page and informed

consent was obtained electronically. Participation was voluntary, and no incentives were provided. Minimal identifying personal information was collected (e.g. first three digits of postal code).

Questionnaire

The questionnaire was developed with RTOERO leadership and included 32 questions (**eAppendix** in the **Supplement**). Several questions were adapted with permission from the *Stanford Coronavirus Survey* (https://pcrt.stanford.edu/covid). Questions examined the impact of COVID-19 on daily life; loneliness; and the use of digital technologies for social connectivity. We used a single-item, direct measure of loneliness by asking respondents "In the past seven days, which statement best applies?" (I did not feel lonely; I felt lonely one or two days; I felt lonely several days; I felt lonely most days; I felt lonely every day). This approach was adapted from the *Canadian Longitudinal Study on Aging* (CLSA)[2] and the UK's *Community Life Survey*[37] which measure loneliness by directly asking "How often do you feel lonely?" (often/always, some of the time, occasionally, hardly ever or never). We chose this approach because it allowed respondents to self-report on loneliness, anchored their response to a time during the pandemic stay-at-home measures, and was considered more suitable for the pandemic context, where asking indirectly about feeling "left out" to infer loneliness may be less relevant as distancing and stay-at-home measures were universally applied.

Respondents were also asked about their history of COVID-19 symptoms and testing, the extent to which they were practising physical distancing and stay-at-home measures, and sociodemographic characteristics (i.e. age, sex, ethnicity, language, health status and location of residence). The ethnic response categories we used mirrored those used in Canada's national health survey.[38] The questionnaire was pretested in English with 18 RTOERO board members and staff, and in French by 1 staff member, for usability, technical functionality, clarity, flow, sensitive questions, and timing. Pretest results were not included in the final analysis.

Patient and public involvement

As noted above, RTOERO leadership (which comprise members of RTOERO) were involved in all aspects of the study, including questionnaire development, pretesting, and participant recruitment. Preliminary results were shared with the team and feedback was incorporated into the final analysis and manuscript. RTOERO's chief executive officer is a coauthor (JG) and critically reviewed the manuscript. Results were shared with RTOERO members through a webinar in the fall of 2020.

Data collection

The questionnaire was administered using SimpleSurvey™. Data were stored in an encrypted, password protected form on the secure Simple Survey server and were downloaded to the secure, password-protected Women's College Hospital server accessible to authorized team members. All questions were optional, so completeness checks were not performed; although, respondents were reminded of unanswered questions before proceeding to the next section to minimize incomplete data. We used adaptive questioning to reduce the complexity of questions.[36,39] Respondents were able to save their responses and return to the survey later to complete it. The survey completion rate was the number of respondents who finished the survey divided by the number consenting to participate.[36] Surveys were only analysed if the respondent clicked "Submit" and responded to more than one question.

Exposures

Sociodemographic characteristics - sex, age, living alone, ethnicity, rural residence, health status, and caregiver status – were collected, based on factors previously reported to be associated with loneliness.[4,5] We additionally collected self-reported measures of social support – communication frequency, receiving offers of assistance and social media use – as well as attitudes and behaviours towards COVID-19 hypothesized to contribute to loneliness, including level of concern, change in daily

routine, extent of physical distancing, and perceived positive effects of distancing measures. Variable definitions are presented in the **eMethods** in the **Supplement**.

Outcome

Our primary outcome was loneliness. Respondents were categorized as lonely 'always or often' if they reported feeling lonely every or most days in the preceding 7 days; lonely 'some of the time' if they reported feeling lonely on 1-2 or several days; and 'not lonely' if they reported they had not felt lonely at all. We further collapsed the first two categories to create a dichotomous variable for loneliness, where respondents were classified as lonely if they reported feeling lonely on 1 or more days in the preceding 7 days.[2,37]

Analysis

Chi-squared tests were used to identify sex differences. To identify predictors of loneliness for older women and men, exploratory analyses using sex-stratified and sex-pooled multivariable logistic regression models were conducted. In the sex-stratified regression analysis, we calculated unadjusted and minimally adjusted (age and health status) models, and used findings to inform which interactions to test for in the sex-pooled analysis. In the sex-pooled model, we additionally adjusted for all covariates and formally tested for sex interactions with explanatory factors, including age group, living alone, communication frequency, receiving offers of assistance, change in daily routine, and perceived positive effects of distancing measures, using interaction terms. Statistical tests were two sided, with $P < .05$ interpreted as statistically significant. Analyses were performed using SAS version 9.4.

Results

Overall, 5556 RTOERO members responded to the survey, of which 5509 provided consent. 4891 surveys were submitted, for a completion rate of 88.8%. We excluded 12 respondents who responded to ≤1 survey question, leaving 4879 respondents included in the analysis.

Characteristics

Most respondents were women (3421/4818 [71.0%]), between the ages of 65-79 years (3279/4863 [67.4%]) and completed the survey in English (97.6%) (**Table 1**). They were similar to the broader RTOERO membership in terms of sex (67% female), age distribution (14.5% <65 years; 64% 65-79 years; 21.5% ≥80 years) and preferred language (95% English) (personal communication, J. Grieve). One third of female respondents lived alone (1138/3356 [33.9%]) compared to one fifth of men (266/1351[19.7%]). Respondents were predominantly white (4454/4861 [91.6%]) and in good self-reported health (4370/4873 [89.7%]).

Less than 5% (236/4790 [4.9%]) reported a cold or flu-like illness in the preceding month. Overall, 8 of 4861 respondents tested positive for COVID-19 (0.2%). Most respondents strongly agreed that the COVID-19 pandemic had changed their daily routine (67.5% females vs. 63.2% males, P=0.0047). Additional data on the impact of COVID-19 are reported in e**Table 1** and **eFigure 1** of the **Supplement**.

Loneliness during COVID-19

Overall, 43.1% of respondents felt lonely at least some of the time (34.8% some of the time and 8.3% always or often) (**Table 2**). Women were more likely to report feeling lonely than males (P<0.001). Strategies to avoid feeling lonely included, connecting with a friend or family member (82.1% women vs. 70.7% men, P<0.001) and getting fresh air (65.3% vs. 61.9%, P=0.025). Seven percent (7.1%) described other strategies, such as reading, housework and/or gardening, and practising their faith. Most participants frequently spoke with a friend, family member or neighbour, although, a small proportion

(0.4%) had no connection at all. Many used social networking websites or apps (87.3% females vs. 78.2% males, P<0.001).

Sex-stratified model

Most factors associated with loneliness were shared amongst women and men (**Table 3**). Older age significantly reduced the odds of loneliness in both sexes after adjustment for self-reported health status. Living alone was associated with loneliness in both women and men; although, the association was greater in men (adjusted Odds Ratio (aOR) 3.86 [95% Confidence Interval (CI) 2.88-5.18] vs. aOR 2.50 [95% CI 2.14-2.92]). Self-reported poor health and higher concern for the pandemic were also associated with loneliness, as were experiencing change to a daily routine, and not experiencing any positive effects or 'silver linings' of pandemic distancing measures; effect sizes varied by sex. Among women, receiving offers of assistance (aOR 0.79 [95% CI 0.69-0.91]) and communicating more often with a friend, family member or neighbour (aOR 0.47 [95% CI 0.34-0.66]) reduced the odds of loneliness.

Sex-pooled model

Women had increased odds of loneliness compared to men, irrespective of living arrangement (aOR 1.52 [95% CI 1.13-2.04] living alone; aOR 2.44 [95%CI 2.04-2.92] living with others) (**Table 4**). Increasing age group was associated with decreasing odds of loneliness. The association of living alone with loneliness was significantly greater for men than women (aOR 4.26 [95% CI 3.15-5.76] vs. 2.65 [95% CI 2.26-3.11], P=0.006 for interaction term). Additional characteristics associated with loneliness included: self-reported fair/poor health (aOR 1.93 [95% CI 1.54-2.41]), being a caregiver (aOR 1.18 [95% CI 1.02-1.37]) and receiving care from a caregiver (aOR 1.47 [95% CI 1.19-1.81]). Pandemic-related factors associated with an increased odds of loneliness included having a high concern for the pandemic (aOR 1.55 [95% CI 1.31-1.84]), not experiencing any positive effects or 'silver linings' of pandemic distancing measures (aOR 1.94 [95% CI 1.62-2.32]) and experiencing change to a daily routine (aOR 2.81 [95% CI

1.96-4.03]). Non-white ethnicity (aOR 0.71 [95% CI 0.54-0.94]), high frequency of communication (aOR 0.55 [95% CI 0.43-0.72]) and receiving offers of assistance (aOR 0.79 [95% CI 0.69-0.90]) reduced the odds of loneliness. None of the other sex-based interactions we explored with explanatory factors were significant. Social media use was not associated with loneliness (aOR 1.13 [95% 0.94-1.36]) and the addition of an interaction term between social media use and age was similarly not significant.

Discussion

In a survey of 4879 older women and men, we found that loneliness was common during the COVID-19 pandemic, with more than one-third (34.8%) of respondents reporting feeling lonely some of the time and 8.3% feeling lonely always or often. More women reported feeling lonely than men and had higher odds of loneliness, despite controlling for factors hypothesized to contribute to sex differences including living alone, health status, and caregiving. Our findings are similar to reports from the UK, where 22.4% and 4.1% of older adults reported feeling lonely sometimes or often, respectively, in the first four weeks of lockdown[32], and from the US, where 13.8% (95% CI 11.4%-16.6%) of adults aged ≥18 years reported feeling lonely always or often at the beginning of April 2020.[25]

Living alone is as an important risk factor for loneliness, both pre-COVID-19[5,40,41] and during the pandemic.[31-33] We found that living alone predicted loneliness in women and men, although the effect was greater in men. Physical distancing and stay-at-home measures are anticipated to have a greater toll for those living alone as they severely limit opportunities for face-to-face interaction to combat loneliness.[33] The effect of living alone on loneliness may be greater in men because they tend to have fewer social contacts and close friends than women.[35,42,43] Indeed, male respondents in our survey communicated less frequently with family, friends, and neighbours, and were less likely to seek out social connection to mitigate loneliness. Having a smaller social network may exacerbate some of the

negative effects of living alone. Emerson recently found that older US adults who lived alone were less likely to have a close relationship that provided emotional security and well-being, and more likely to become 'more lonely' following the onset of COVID-19 than those living with others (42.4% vs. 27.9%).[31] Alternatively, our finding may be due to the inherent overlap in the constructs of 'living alone' and 'marital status' because we partially captured the impact of being widowed or unmarried in men versus women. Prior research has shown that being single has a greater impact on men's loneliness, possibly explained by the fact that for many older men, their partners are their main confidante and source of intimacy.[44,45]

We found that older adults' perceptions and pandemic experiences were also associated with loneliness. Respondents who had a high level of concern for COVID-19, experienced changes to their daily routine, and reported no perceived positive effects or 'silver livings' from the pandemic had increased odds of loneliness, while receiving offers of support and frequently communicating with family, friends and neighbours were protective. These findings underscore the importance of public health messages from the World Health Organization targeted at older adults, including maintaining regular routines or creating new ones that include exercise, regular cleaning/chores, and enjoyable activities; keeping in regular contact with loved ones; and restricting news consumption to specific times of day from reputable sources to reduce undue anxiety or distress.[46]

Family physician visits have been suggested as an important opportunity to screen for loneliness during COVID-19.[47,48] Particular attention is recommended to be paid to patients who are older, live alone or have pre-existing health conditions.[47] Our findings suggest that considering the patient's sex, if they have sufficient social support, and how the pandemic is affecting their daily routines could further assist in identifying at-risk individuals. Such questions would also be beneficial to align patients more purposefully with interventions. Virtual consultations and social prescribing (i.e. linking patients with nonclinical supports in their community such as outdoor exercise classes, walking groups, virtual

bereavement programs, etc) may be effective strategies to reduce loneliness during COVID-19 and beyond.[47,49,50] Additionally, the Campaign to End Loneliness recently profiled psychological approaches,[51] including cognitive behavioural therapy (CBT)[52,53], mindfulness[54], and positive psychology,[55] as promising interventions for addressing loneliness in older adults.

Lastly, technology can facilitate social connection and improve access to psychological interventions in the midst of physical distancing measures.[49,56] For older adults experiencing social loneliness as a result of being disconnected from their social network, websites or apps such as Facetime and Zoom can connect them to family and friends and provide continuity of group activities such as exercise classes, spiritual services, etc.[57] These platforms can similarly enable access to virtual CBT and other psychological supports.[57] One important consideration, however, is that, in order to be effective, older adults must want to, know how to use, and have access to these technologies.[57] Recent research shows that many older adults lack access to internet-enabled devices[58], and are unready for comparable technologies (i.e. video telemedicine visits) due to inexperience with technology or physical disability.[59] Consistent with prior research[31,60] and likely a function of electronic survey administration, we found high levels (~85%) of social media engagement, with no increased risk for loneliness overall or by age. Our findings suggest there is a large segment of the older adult population for whom digital media-based interventions may be effective for mitigating and alleviating loneliness. Services that teach older adults how to use and connect with family and friends through social media platforms may be valuable.[61] The importance of offline connection, however, should not be forgotten – phoning parents or older neighbours, and extending offers of assistance can go a long way to making someone feel connected and visible.[62]

A recent US study reported that 30.9% of older adults surveyed felt more lonely after COVID-19 related physical distancing was implemented.[31] Our estimates of loneliness were almost double that of the CLSA's collected between 2010-2015 using a similar age group and measurement approach (49.3% of

women and 27.1% men aged 65-79 years felt lonely some of the time vs. 24.7% and 17.9%, respectively, for adults aged 65-74 years).[2,63] Comparisons should be made cautiously considering differences in study populations. Longitudinal studies provide the most robust evidence of temporal changes. Using data collected at three time points, Luchetti et al found that older adults were the only group studied that showed a slight increase in loneliness in late March 2020 after social distancing measures were implemented in the US compared to the baseline assessment in January/February, although levels remained stable in April.[33] The study found that this increase was driven primarily by unavailable social connections, rather than feelings of isolation. O'Connor et al similarly observed an increase in self-reported loneliness in adults aged ≥60 years at two time points early in the pandemic but not in younger age groups,[64] while other studies have reported no change in loneliness over the course of the first pandemic wave.[26,65] As we move through the second pandemic wave, it will continue to be important to consistently measure how rates of loneliness change across different age groups to assess the longer-term effects of protracted physical distancing and stay-at-home measures. Such longitudinal studies will be vital to characterizing trajectories, identifying drivers of change and determining at-risk populations who could benefit from additional support, including young adults, who have reported among the highest levels of loneliness during this pandemic.[33,64,65]

Limitations

Our study leveraged a strong community-based partnership to obtain timely data from a large sample of older Canadians on the impacts of COVID-19 during the first wave but had several limitations. Given the cross-sectional study design, causation should not be inferred. Analyses were exploratory and intended to identify characteristics and circumstances associated with loneliness to help target supports to those who could benefit from them. The second limitation is that the data are based on a convenience sample of retired, educational staff, who are not fully representative of the Canadian population. The perspectives of vulnerable groups who may be at greater risk for loneliness (e.g. those with severe

mental health illness, low income, no home internet access, etc.) are likely underrepresented in this sample. As such, our findings may be a conservative estimate of loneliness. Finally, the measure of loneliness used in our study has not been validated; although, our findings support its criterion validity.

Conclusions

While many older adults reported feeling lonely during the first wave of COVID-19, several characteristics – in particular being female and living alone – increased the odds of loneliness. These characteristics may help guide targeting interventions to reduce loneliness as the pandemic persists.

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Competing interests

None declared

Author Contributions

RDS, PAR and JG conceived of the study and its design. RDS took the lead in the planning of the study and in writing the manuscript. JL, AL, and JG contributed to data collection by creating, pre-testing and administering the survey. WW performed the statistical analysis. RDS, SEB, SAC, JG, AG, CR, NMS, and

PAR contributed to the content of the survey instrument. All authors contributed to the interpretation of the results and critically revised the final manuscript.

Data Availability

Data are available upon reasonable request.

Role of the Funder/Sponsor

Study funders/sponsors had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; nor the decision to submit the manuscript for publication.

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Table 1. Sociodemographic characteristics of older female and male survey respondents.

Characteristics	All (N=4,879)[a]	Women (n=3,421)	Men (n=1,397)
Language of Survey			
English	4762 (97.6%)	3339 (97.6%)	1365 (97.7%)
French	117 (2.4%)	82 (2.4%)	32 (2.3%)
Age, years	n=4,863	n=3,416	n=1,395
<65	1027 (21.1%)	846 (24.8%)	174 (12.5%)
65-79	3279 (67.4%)	2295 (67.2%)	945 (67.7%)
80+	557 (11.5%)	275 (8.1%)	276 (19.8%)
Living arrangement	n=4,762	n=3,356	n=1,351
Lives alone	1415 (29.7%)	1138 (33.9%)	266 (19.7%)
Access to private outdoor space	n=4,854	n=3,407	n=1,391
Yes	4706 (97.0%)	3302 (96.9%)	1350 (97.1%)
Ethnicity	n=4,861	n=3,410	n=1,397
White/Caucasian	4454 (91.6%)	3153 (92.5%)	1264 (90.5%)
Black/African Canadian	19 (0.4%)	15 (0.4%)	≤5
Chinese	19 (0.4%)	14 (0.4%)	≤5
Indigenous	11 (0.2%)	7 (0.2%)	≤5
South Asian (Indian, Sri Lankan, etc.)	17 (0.3%)	7 (0.2%)	9 (0.6%)
Southeast Asian (Japanese, Vietnamese, Korean, Cambodian, etc.)	14 (0.3%)	11 (0.3%)	≤5
West Asian (Arabian, Egyptian, Iranian, Afghan, etc.)	10 (0.2%)	7 (0.2%)	≤5
Other/Prefer to not say or self-identify	317 (6.5%)	196 (5.7%)	106 (7.6%)
Language spoken most often at home	n=4,855	n=3,411	n=1,388
English	4627 (95.3%)	3251 (95.3%)	1327 (95.6%)
French	165 (3.4%)	120 (3.5%)	41 (3.0%)
Other	63 (1.3%)	40 (1.2%)	20 (1.4%)
Self-reported health status	n=4,873	n=3,417	n=1,397
Excellent/very good/good	4370 (89.7%)	3082 (90.2%)	1238 (88.6%)
Fair/poor	492 (10.1%)	330 (9.7%)	154 (11.0%)
Don't Know	11 (0.2%)	5 (0.2%)	5 (0.4%)
Location of residence[b]	n=4,752	n=3,348	n=1,354
Urban	3962 (83.4%)	2791 (83.4%)	1132 (83.6%)
Rural	751 (15.8%)	531 (15.9%)	209 (15.4%)
Outside Canada	39 (0.8%)	26 (0.8%)	13 (1.0%)

[a] 61 respondents did not identify their gender

[b] 4405 (92.7%) respondents resided in Ontario and 308 (6.5%) in another Canadian province or territory.

Table 2. Loneliness and social connection in a sample of older Canadians, May 2020.

	All (N=4,879)[a]	Women (N=3,421)	Men (N=1,397)	P-value
Self-reported loneliness in past seven days	n=4,840	n=3,398	n=1,383	
Did not feel lonely	2675 (55.3%)	1684 (49.6%)	958 (69.3%)	<0.001
Lonely some of the time	1684 (34.8%)	1360 (40.0%)	307 (22.2%)	
Lonely always or often	404 (8.3%)	315 (9.3%)	83 (6.0%)	
Don't know	77 (1.6%)	39 (1.1%)	35 (2.5%)	
Strategies used to avoid feeling lonely [b]				
Connect with a friend or family member	3841 (78.7%)	2808 (82.1%)	988 (70.7%)	<0.001
Get fresh air	3134 (64.2%)	2235 (65.3%)	865 (61.9%)	0.025
Stay busy with work or projects	1855 (38.0%)	1275 (37.3%)	563 (40.3%)	0.049
Get active	1632 (33.5%)	1137 (33.2%)	470 (33.6%)	0.785
Try to get proper rest and sleep	1221 (25.0%)	806 (23.6%)	397 (28.4%)	<0.001
Engage in a hobby	1012 (20.7%)	704 (20.6%)	297 (21.3%)	0.597
Spend time with my pet	612 (12.5%)	473 (13.8%)	129 (9.2%)	<0.001
Other	347 (7.1%)	248 (7.3%)	95 (6.8%)	0.582
Frequency of speaking with a friend, family member or neighbour	n=4,865	n=3,412	n=1394	
Not at all	18 (0.4%)	4 (0.1%)	13 (0.9%)	<0.001
1-4 times	1401 (28.8%)	845 (24.8%)	535 (38.4%)	
5-7 times	3446 (70.8%)	2563 (75.1%)	846 (60.7%)	
Uses social networking websites or apps to communicate with friends and family	n=4,868	n=3,418	n=1394	
Yes	4113 (84.5%)	2983 (87.3%)	1090 (78.2%)	<0.001
No	751 (15.4%)	434 (12.7%)	301 (21.6%)	
Don't know	4 (0.1%)	1 (0.0%)	3 (0.2%)	

Table 2.Loneliness and social connection in a sample of older Canadians, May 2020 (Continued)

	All (N=4,879)[a]	Women (N=3,421)	Men (N=1,397)	P-value
Apps used [b]				
Facebook	3031 (62.1%)	2235 (65.3%)	768 (55.0%)	<0.001
Zoom	2558 (52.4%)	1918 (56.1%)	617 (44.2%)	<0.001
FaceTime	2444 (50.1%)	1874 (54.8%)	546 (39.1%)	<0.001
WhatsApp	1182 (24.2%)	931 (27.2%)	239 (17.1%)	<0.001
Instagram	1125 (23.1%)	914 (26.7%)	201 (14.4%)	<0.001
Skype	772 (15.8%)	523 (15.3%)	244 (17.5%)	0.061
Twitter	575 (11.8%)	429 (12.5%)	141 (10.1%)	0.017
Google Hangouts/Meet	322 (6.6%)	255 (7.5%)	64 (4.6%)	<0.001
Houseparty	212 (4.4%)	178 (5.2%)	34 (2.4%)	<0.001
Other	368 (7.5%)	275 (8.0%)	89 (6.4%)	0.047
Devices used [b]				
Smartphone	3026 (62.0%)	2204 (64.4%)	791 (56.6%)	<0.001
Desktop/laptop	2579 (52.9%)	1704 (49.8%)	846 (60.6%)	<0.001
Landline telephone	2528 (51.8%)	1776 (51.9%)	714 (51.1%)	0.612
Tablet	2283 (46.8%)	1659 (48.5%)	594 (42.5%)	<0.001
Other	172 (3.5%)	136 (4.0%)	33 (2.4%)	0.006

[a] 61 respondents did not identify their gender

[b] categories not mutually exclusive

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020.

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Sociodemographic characteristics						
Age, years						
<65 (ref)	440 (52.8)	--	--	65 (38.5)	--	--
65-79	1110 (49.3)	0.87 (0.74-1.02)	0.84 (0.72-0.99)	248 (27.1)	0.59 (0.42-0.84)	0.56 (0.39-0.78)
80+	125 (46.3)	0.77 (0.59-1.01)	0.70 (0.53-0.92)	77 (29.5)	0.67 (0.45-1.01)	0.61 (0.40-0.92)
Living arrangement						
Lives with others (ref)	935 (43.0)	--	--	242 (23.0)	--	--
Lives alone	714 (63.6)	2.32 (2.00-2.67)	2.50 (2.14-2.92)	137 (54.2)	3.95 (2.97-5.26)	3.86 (2.88-5.18)
Ethnicity						
White (ref)	1565 (50.5)	--	--	357 (29.2)	--	--
Non-White	77 (41.6)	0.70 (0.52-0.94)	0.70(0.51-0.95)	19 (26.4)	0.87(0.51-1.49)	0.83(0.48-1.43)
Residence of location						
Urban (ref)	1378 (50.4)	--	--	312 (28.5)	--	--
Rural	256 (48.7)	0.94 (0.78-1.13)	0.93 (0.77-1.13)	58 (29.2)	1.03 (0.74-1.44)	1.09 (0.78-1.54)
Health status						
Good (ref)	1456 (48.1)	--	--	324 (27.0)	--	--
Fair/Poor	216 (66.9)	2.18 (1.71-2.78)	2.24 (1.76-2.86)*	65 (45.1)	2.22(1.56-3.16)	2.34 (1.64-3.34)[a]
Caregiver to another person						
No (ref)	1198 (49.4)	--	--	304 (28.5)	--	--
Yes	469 (51.0)	1.07 (0.92-1.25)	1.05 (0.90-1.23)	83 (30.1)	1.08 (0.81-1.44)	1.03 (0.77-1.39)
Receives care						
No (ref)	1447 (48.5)	--	--	319 (27.5)	--	--
Yes	220 (61.1)	1.67 (1.33-2.09)	1.55 (1.23-1.97)	68 (37.6)	1.59(1.15-2.20)	1.39 (0.97-2.00)

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020 (Continued).

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Social Support						
Social media use						
No (ref)	213 (50.1)	--	--	91 (31.5)	--	--
Yes	1458 (49.8)	0.99(0.80-1.21)	1.00 (0.81-1.23)	299 (28.4)	0.86(0.65-1.14)	0.90 (0.68-1.20)
Communication frequency[b]						
None or low (ref)	120 (68.6)	--	--	55 (36.9)	--	--
High	1551 (48.9)	0.44 (0.32-0.61)	0.47 (0.34-0.66)	334 (27.9)	0.66 (0.46-0.95)	0.74 (0.61-1.06)
Received offers of assistance[c]						
No (ref)	1016 (52.5)	--	--	253 (28.7)	--	--
Yes	650 (46.3)	0.78 (0.68-0.90)	0.79 (0.69-0.91)	136 (29.5)	1.04 (0.81-1.33)	1.05 (0.82-1.36)
Attitudes and behaviours towards COVID-19						
Concern for pandemic						
Low level (ref)	260 (42.1)	--	--	62 (19.8)	--	--
High level	1407 (51.6)	1.47 (1.23-1.75)	1.46 (1.22-1.74)	328 (31.8)	1.90 (1.40-2.58)	1.86 (1.36-2.53)
Extent practising physical distancing						
None/some (ref)	155 (47.3)	--	--	40 (22.5)	--	--
Most of time	1231 (49.9)	1.11(0.88-1.40)	1.06 (0.84-1.34)	295 (29.9)	1.47(1.01-2.15)	1.41 (0.96-2.07)
All of time	283 (51.4)	1.18 (0.90-1.55)	1.06(0.80-1.40)	55 (30.7)	1.53 (0.95-2.46)	1.31 (0.80-2.14)
No perceived positive effects of distancing						
No (ref)	1331 (46.7)	--	--	306 (27.5)	--	--
Yes	344 (67.3)	2.35(1.92-2.86)	2.25 (1.84-2.75)	84 (35.9)	1.48(1.10-1.99)	1.44 (1.06-1.95)

Table 3. Odds ratios (OR) for loneliness stratified by sex in a sample of older Canadians, May 2020 (Continued).

	Women			Men		
	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)	n (%) Lonely	Unadjusted OR (95% CI)	Age- & health-adjusted OR (95% CI)
Change in daily routine						
No (ref)	46 (34.9)	--	--	6 (8.2)	--	--
Yes	1623 (50.4)	1.90 (1.32-2.74)	2.02 (1.39-2.92)	383 (30.2)	4.83(2.08-11.24)	5.57(2.37-13.11)

[a] Adjusted for age group only.
[b] Self-reported communication with friends, family members or neighbours.
[c] Reported receiving offers of assistance from their community to help with daily life during COVID-19 distancing measures.

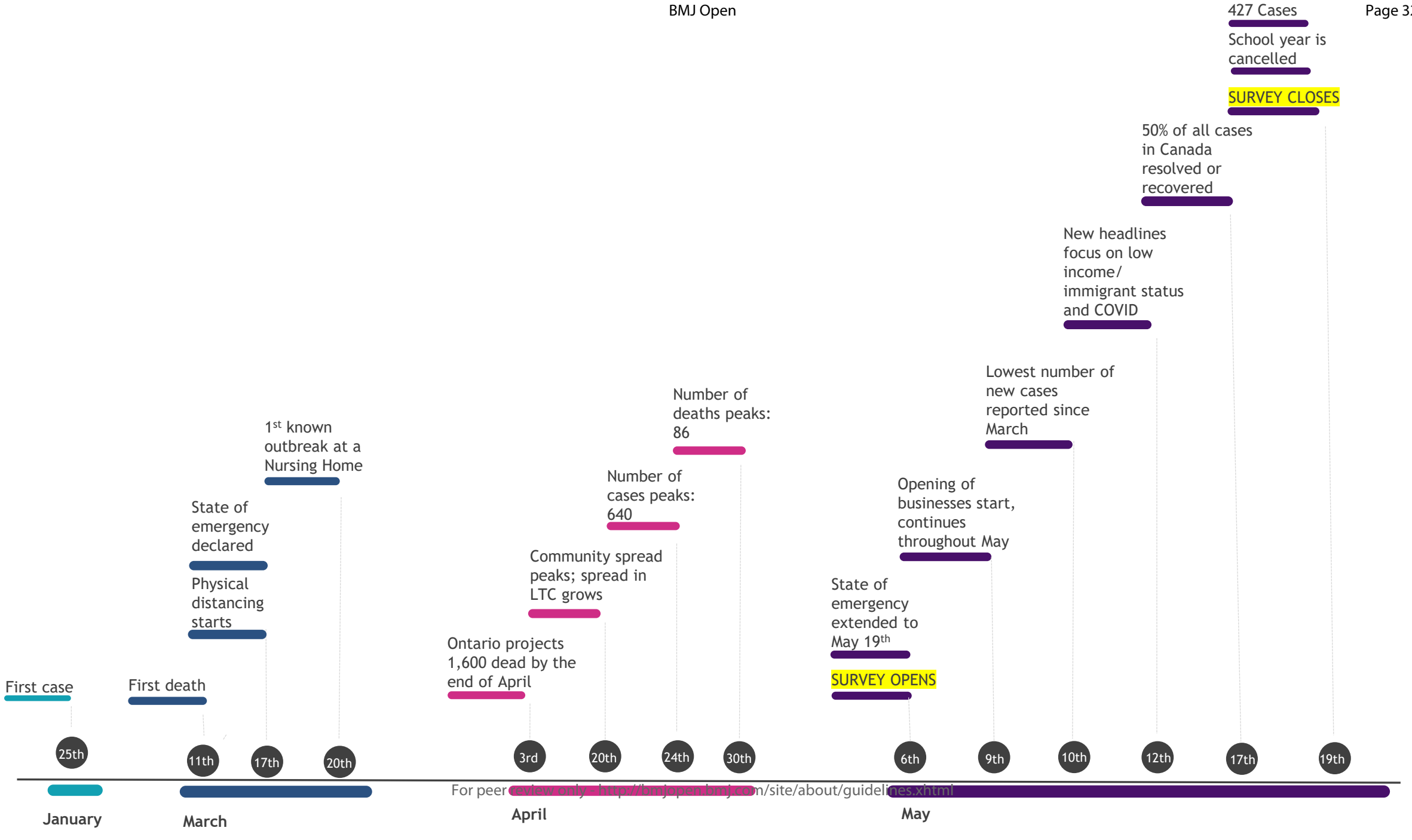
Table 4. Odds ratios (OR) for loneliness (sex-pooled) in a sample of older Canadians, May 2020.

	All respondents			
	Unadjusted OR (95% CI)	Age- & sex-Adjusted OR (95% CI)	Age-, sex-, & health status-Adjusted OR (95% CI)	Fully[a] adjusted OR (95% CI)
Sociodemographic				
Female sex (ref male)	2.44 (2.13-2.80)	2.38 (2.07-2.73)	2.41 (2.09-2.77)	
Women living alone				1.52 (1.13-2.04)
Women living with others				2.44 (2.04-2.92)
Age, years				
65-79 (ref <65)	0.74 (0.64-0.86)	0.81 (0.70-0.94)	0.78 (0.67-0.90)	0.69 (0.59-0.81)
80+ (ref <65)	0.61 (0.49-0.75)	0.79 (0.63-0.98)	0.72 (0.57-0.90)	0.50 (0.39-0.65)
Living alone	2.83 (2.49-3.22)	2.78 (2.42-3.18)	2.74 (2.39-3.15)	
Living alone in women				2.65 (2.26-3.11)
Living alone in men				4.26 (3.15-5.76)
Non-white ethnicity	0.75 (0.58-0.97)	0.74 (0.57-0.96)	0.72 (0.55-0.94)	0.71 (0.54-0.94)
Rural	0.98 (0.83-1.15)	0.95 (0.81-1.12)	0.96 (0.82-1.13)	1.07 (0.90-1.27)
Fair or poor health status	2.14 (1.76-2.60)	2.25 (1.84-2.76)	--	1.93 (1.54-2.41)
Caregiver to another person	1.14 (1.00-1.30)	1.04 (0.91-1.20)	1.05 (0.91-1.20)	1.18 (1.02-1.37)
Receives care	1.54 (1.29-1.84)	1.76 (1.45-2.12)	1.50 (1.24-1.83)	1.47 (1.19-1.81)
Social support				
Social media use	1.08 (0.92-1.26)	0.93 (0.78-1.09)	0.96 (0.81-1.14)	1.13 (0.94-1.36)
High communication frequency	0.65 (0.52-0.81)	0.53 (0.42-0.68)	0.57 (0.45-0.72)	0.55 (0.43-0.72)
Received offers of assistance	0.89 (0.79-1.00)	0.85 (0.75-0.96)	0.85 (0.75-0.96)	0.79 (0.69-0.90)
Attitudes and behaviours towards COVID-19				
High concern for pandemic	1.65 (1.42-1.91)	1.59 (1.37-1.86)	1.56 (1.33-1.82)	1.55 (1.31-1.84)
Extent practising distancing				
Most of time (ref none/some)	1.27 (1.05-1.53)	1.19 (0.98-1.45)	1.15 (0.95-1.40)	1.23 (0.99-1.53)
All of time (ref none/some)	1.39 (1.11-1.75)	1.29 (1.02-1.64)	1.13 (0.89-1.44)	1.12 (0.86-1.45)
No perceived positive effects of pandemic distancing measures	1.90 (1.62-2.22)	2.07 (1.76-2.43)	1.97 (1.67-2.32)	1.94 (1.62-2.32)
Reported change in routine	2.36 (1.72-3.24)	2.30 (1.67-3.19)	2.50 (1.80-3.48)	2.81 (1.96-4.03)

[a] Adjusted for all covariates listed in the table with an interaction term for sex and living alone (P-value =0.006).

Figure 1. Timeline of COVID-19 in Ontario, Canada's largest province.

Physical distancing measures beginning March 17 included closure of all indoor recreational facilities, public libraries, theatres, cinemas, bars, and restaurants. Publicly funded schools were closed by this point as well, and all employers in Ontario were asked to facilitate virtual work arrangements for employees. Remaining non-essential businesses were closed March 25. Gatherings of more than 5 people were prohibited on March 28. On March 30, Ontario's Chief Medical Officer of Health strongly recommended individuals over 70 years of age or those with compromised immune systems or underlying medical conditions to stay at home. Source: CIHI, COVID-19 Intervention Scan, Accessed Aug 11 2020, https://www.cihi.ca/en/covid-19-intervention-scan



Supplement. Loneliness among older adults in the community during COVID-19

eAppendix. Questionnaire

The Impact of COVID-19 Physical Distancing Measures on Older Canadians and Strategies to Address Unmet Needs: A Survey of Retired Educators

Introduction

Welcome! Thank you for agreeing to participate in this survey. We value your opinions and we appreciate your participation in this process.

The Study Information Sheet will answer many of your questions and reviews your rights and responsibilities as a participant in this research project. You can access the Study Information Sheet by clicking this link. You may print a copy of the Study Information Sheet for your records.

If you have additional questions, please contact Joyce Li, Research Coordinator (joyce.li@wchospital.ca) before continuing further.

Electronic Consent

Please select your choice below. Clicking on the "Agree" button indicates your confirmation that:

This research study has been fully explained to me and all of my questions answered to my satisfaction
I understand the requirements of participating in this research study
I have been informed of the risks and benefits, if any, of participating in this research study
I have been informed of any alternatives to participating in this research study
I have been informed of the rights of research participants
I have read each page of the Study Information Sheet
I have agreed to participate in this research study

Electronic Consent

- ○ Agree
- ○ Disagree

The Coronavirus pandemic (COVID-19) is impacting all Canadians but older adults are experiencing its impacts in unique ways. This survey will help us understand if and how COVID-19 is affecting your health, as well your social circumstances and supports you have available. This information will be used by researchers at Women's College Hospital as well as RTOERO leadership to develop supports for older adults and for our members during and after the COVID-19 pandemic. The survey is anonymous and will take about 10-20 minutes to complete.

A) Daily life during COVID-19

1. To what extent would you agree with the following statement: The Covid-19 crisis has changed my daily routine.

- ○ Strongly Agree
- ○ Somewhat Agree
- ○ Neutral
- ○ Somewhat Disagree
- ○ Strongly Disagree

○ Don't know

Comment:

2. How are you spending your time now? Select all that apply.

□ Watching more TV
□ More time on my hobbies
□ COVID-19-related community work (making masks, grocery shopping, meal or supply drop-offs, etc)
□ Working from home
□ Going on walks
□ More time exercising
□ More time cooking or baking
□ More time making or taking phone calls from friends/relatives
□ More time on the internet and social media
□ I am not spending my time differently than before COVID-19
□ Other, please specify:

3. Have you experienced any of the following difficulties due to COVID-19? Please select all that apply.

□ Getting/ordering groceries
□ Getting supplies (e.g. toilet paper, hand sanitizer, cleaning products, bleach, etc.)
□ Getting prescription medications
□ Accessing healthcare
□ Changes to planned health treatments (e.g. cancer treatment, outpatient procedure, surgery, etc).
Please Specify:
□ Other, please describe:
□ I have not experienced any difficulties

4. Although this is a challenging time, have you experienced any positive effects or 'silver linings' during this crisis? Please select all that apply.

□ Stronger sense of community
□ Feeling more connected to partner, family and friends
□ A growing respect for older adults and their needs by society (e.g. designated grocery shopping hours)
□ Slower pace of life / more time to relax or rest
□ No or less time spent commuting to work
□ Improved access to healthcare through virtual care
□ Other, please describe:
□ I have not experienced any positive effects of this crisis

Comment:

5. How concerned are you about the COVID-19 pandemic?

○ Extremely concerned
○ Very concerned
○ Moderately concerned
○ Slightly concerned
○ Not at all concerned

6. To what extent are you practising physical distancing?

- ○ All of the time. I am staying home all of the time.
- ○ Most of the time. I only leave my home to buy essentials or for necessary medical appointments.
- ○ Some of the time. I have reduced the amount of time I spend in public.
- ○ None of the time. I am doing everything that I normally do.

7. The COVID-19 pandemic and physical distancing measures have created new or additional concerns for many people. Select your top three concerns.

- □ Getting sick from COVID-19
- □ A loved one getting sick from COVID-19
- □ The health system becoming overloaded (not enough hospital beds or supplies)
- □ Not being able to meet basic needs (put food on the table or pay bills)
- □ Feeling lonely, anxious or depressed
- □ Limited access to routine healthcare
- □ Not being able to adequately take care of my health
- □ Not being able to adequately care for loved ones
- □ Not being able to visit loved ones in long-term care
- □ Family stress from confinement
- □ Unwittingly spreading COVID-19 (if sick without symptoms)
- □ My children or grandchildren's education or work
- □ Economic recession and retirement savings
- □ Other – please indicate:

8. In the past 4 weeks, have you been in close contact with a person who has tested positive for COVID-19?

- ○ Yes
- ○ No
- ○ Don't know

9. In the past 4 weeks, have you been ill with a cold or flu-like illness?

- ○ Yes
- ○ No
- ○ Don't know

10. Have you been tested for COVID-19?

- ○ Yes, I was tested and was positive
- ○ Yes, I was tested and was negative
- ○ No, I tried to get tested but could not get a test
- ○ No, I have not tried to get tested

B) Caregiving and receiving care

11. Do you provide assistance to another person because of a health condition or limitation? By assistance we mean personal care, medical treatments, scheduling or coordinating care-related tasks, meal preparation, house maintenance, transportation, social or emotional support, mobility, or financial assistance or management. Please exclude any assistance you provided as part of a volunteer organization or paid job.

- ○ Yes
- ○ No

- Don't Know

Do you live in the same household as this person?

- Yes
- No
- Don't Know

Has the COVID-19 crisis impacted your ability to give care? In what way?

- Yes, please specify:
- No
- Don't know

Comment:

12. Do you receive assistance from family, friends, or neighbours because of a health condition or limitation that affects your daily activities?

- Yes
- No
- Don't Know

Does your caregiver live in the same household as you?

- Yes
- No
- Don't Know

Has the COVID-19 crisis impacted your ability to receive care? In what way?

- Yes, please specify:
- No
- Don't know

C) Social connections during COVID-19

To reduce the spread of COVID-19, the government and public health officials have asked Canadians to practise physical distancing (i.e. minimizing close contact with others). While physical distancing is necessary to slow the spread of disease, it may lead to loneliness, anxiety or depression.

13. In the past seven days, which statement best applies?

- I did not feel lonely.
- I felt lonely one or two days.
- I felt lonely several days.
- I felt lonely most days.
- I felt lonely every day.
- Don't know.

Comment:

14. What steps do you take to avoid feeling lonely? Please select up to three strategies you use most often.

□ Connect with a friend or family member
□ Get fresh air
□ Get active
□ Stay busy with work or projects
□ Engage in a hobby
□ Try to get proper rest and sleep
□ Spend time with my pet
□ Other, please share any strategies:
□ Please share with us any specific resources you use to avoid feeling lonely (e.g., participating in a virtual book club):

15. In the past seven days, how often did you speak with a friend, family member or neighbour?

○ Not at all
○ 1-2 times
○ Several times (3-4 times)
○ Almost every day (5-6 times)
○ Every day (7 times)

D) Use of technology to stay socially connected

Digital technologies can help us stay socially connected as we practise physical distancing.

16. Do you have access to the Internet at home?

○ Yes
○ No
○ Don't Know

What are the reasons you do not have access to the internet at home? Select all that apply.

□ No need or no interest
□ Cost (service or equipment)
□ The available service does not meet our needs
□ Security or privacy concerns (e.g. viruses, use of personal information)
□ Lack of confidence, knowledge, or skills
□ No Internet-ready device (e.g. desktop computer) available in household
□ Other, please specify:

How would you rate the internet connection in your home?

○ Very good
○ Good
○ Moderate
○ Poor
○ Don't know

17. Do you have a smartphone that you use for personal use? A mobile phone that performs many of the functions of a computer, typically having a touchscreen interface, Internet access, and an operating system capable of running downloaded applications, e.g. Apple iPhone and Samsung Galaxy

○ Yes
○ No

○ Don't know

18. Do you use any social networking websites (e.g. Facebook) or apps (e.g. Zoom or FaceTime) to communicate with friends and family?

○ Yes
○ No
○ Don't know

Please check which sites or apps you use (check all that apply)

□ Facebook
□ Instagram
□ Twitter
□ WhatsApp Messenger
□ Zoom
□ Skype
□ Face Time
□ Houseparty
□ Google Hangouts/meet
□ Other, please specify:

19. What devices do you use most often when connecting with friends and family? Please select all that apply.

□ Desktop/Laptop
□ Tablet
□ Smartphone
□ Landline telephone
□ Other, please specify:

Comment:

E) Supporting older adults during the COVID-19

20. In your view, what are the most pressing needs of older adults during the COVID-19 pandemic? Please select up to 3 issues.

□ Support for caregivers
□ Access to (routine?) healthcare to maintain physical health
□ Resources or supports on how to stay physically healthy during the COVID-19
□ Resources or supports on how to stay mentally healthy during the COVID-19
□ Programs or supports to ensure basic needs are met (e.g. foodbanks, home meal delivery, income supplements, etc.)
□ Policies and procedures to ensure safety of older adults in long-term care
□ Strategies to ensure older adults are able to stay connected with loved ones in long-term care
□ Strategies to help older adults stay socially connected while physically distanced
□ Other, please specify:

Comment:

21. To what extent do you agree or disagree with the following statements?

	Strongly agree	Somewhat agree	Neutral	Somewhat disagree	Strongly disagree
a. I have received offers of assistance from my community to help with daily life during stay at home and physical distancing measures.	○	○	○	○	○
b. Governments and policy makers care about the health and well-being of older adults.	○	○	○	○	○
c. The level of respect for older adults in society has decreased during the COVID-19 pandemic.	○	○	○	○	○
d. I have witnessed ageism in the daily news and popular culture during the COVID-19 pandemic.	○	○	○	○	○

Comment:

F) Sociodemographics

23. Your age

- ○ 54 or younger
- ○ 55-59
- ○ 60-64
- ○ 65-69
- ○ 70-74
- ○ 75-79
- ○ 80+

24. Your gender

- ○ Female
- ○ Male
- ○ Prefer to self identify
- ○ Prefer not to say

25. Including yourself, how many persons are living in your household?

26. Do you have access to private outdoor space (e.g. backyard, terrace or balcony)?

- ○ Yes
- ○ No
- ○ Don't Know

27. How would you describe your ethnic identity?

- ○ Black/African Canadian
- ○ Central/South American

- Chinese
- Filipino
- Indigenous
- South Asian (Indian, Sri Lankan, etc.)
- Southeast Asian (Japanese, Vietnamese, Korean, Cambodian, etc.)
- West Asian (Arabian, Egyptian, Iranian, Afghan, etc.)
- White/Caucasian (European, Russian, etc.)
- Other, please specify:
- Prefer to self-identify
- Prefer not to say

28. What language do you speak most often at home?

- English
- French
- Other, please indicate:

29. In general, would you say your health is... ?

- Excellent
- Very good
- Good
- Fair
- Poor
- Don't Know

30. What are the first 3 digits of your postal code?

G) Overall comments and suggestions

31. How can RTOERO and the Foundation support members during the COVID-19 pandemic?

32. Other comments or suggestions

You have opted not to consent to participate at this time. Thank you for considering the invitation to participate in this survey project.

eMethods. Exposure Variable Definitions

Sociodemographic	Definition
Sex	Based on self-identification as female or male.
Age	Categorized as <65 years if respondent's selected age was '54 or younger', '55-59', or '60-64'; as 65-79 years if they selected '65-69', '70-74' or '75-79'; and as 80+ if they selected '80+'.
Living arrangement	Classified as living alone if reported 1 person living in their household (i.e. themselves) and as living with others if reported >1 person living in their household.
Ethnicity	Classified as white if respondents identified themselves as 'White/Caucasian' or they identified as 'Other' but specified white, Caucasian, Hebrew/Jewish, or white European ethnicity, e.g. Italian, French, Irish, Greek, Welsh, Scottish, etc. Central/South American and Filipino were regrouped into the Other category due to small numbers.
Rural residence	Classified as rural if second digit of reported Canadian postal code was a '0', and outside Canada if no match to a Canadian postal code.[1]
Health status	Classified as 'fair or poor' based on self-reporting fair or poor health; and as 'good' if 'excellent', 'very good' or 'good' health was reported.
Caregiver	Classified as a caregiver if responded that they aid another person because of a health condition or limitation.
Care recipient	Classified as a care recipient if they reported receiving assistance from another person because of a health condition or limitation.
Social support	
Social media use	Classified as yes if respondent reported using any social networking websites (e.g. Facebook) or apps (e.g. Zoom or FaceTime) to communicate with friends and family.
Frequency of communication	Classified as 'high frequency' if reported speaking with a friend, family member or neighbour≥3 times in the prior week.
Receipt of offers of assistance	Classified as yes if respondent strongly or somewhat agreed to the statement "I have received offers of assistance from my community to help with daily life during stay at home and physical distancing measures."
Attitudes and behaviours towards COVID-19	
Level of concern	Classified as 'high concern' if respondent reported they were 'extremely' or 'very concerned' about the COVID-19 pandemic.
Extent practicing physical distancing	Classified as 'all of the time', 'most of the time' or 'some of the time or none' based on self-report.
Change in routine	Classified as yes if respondent strongly or somewhat agreed that the Covid-19 crisis changed their daily routine, and as no if respondent was neutral, or somewhat or strongly disagreed with the statement.

References

1. Statistics Canada. How Postal Codes Map to Geographic Areas. 2007. https://www150.statcan.gc.ca/n1/en/pub/92f0138m/92f0138m2007001-eng.pdf?st=VjySvIB3. Accessed June 30, 2020.

eTable 1. Impact of COVID-19 on daily life reported by a sample of older Canadians, May 2020

	All (N=4,879)[a]	Female (N=3,421)	Male (N=1,397)	P-Value
The COVID-19 crisis has changed my daily routine	n=4,863	n=3,412	n=1,390	
Strongly Agree	3211 (66.0%)	2304 (67.5%)	878 (63.2%)	0.0047
Somewhat Agree	1438 (29.6%)	973 (28.5%)	436 (31.4%)	
Neutral	91 (1.9%)	56 (1.6%)	35 (2.5%)	
Somewhat Disagree	87 (1.8%)	60 (1.8%)	25 (1.8%)	
Strongly Disagree	35 (0.7%)	18 (0.5%)	16 (1.2%)	
Don't know	1 (0.0%)	1 (0.0%)	0	
How time is being spent [b]				
More time on the internet and social media	3584 (73.5%)	2562 (74.9%)	978 (70.0%)	0.0005
Going on walks	3128 (64.1%)	2260 (66.1%)	835 (59.8%)	<0.0001
Watching more TV	2877 (59.0%)	2039 (59.6%)	805 (57.6%)	0.2050
More time making or taking phone calls from friends/relatives	2593 (53.2%)	2026 (59.2%)	543 (38.9%)	<0.0001
More time cooking or baking	2517 (51.6%)	2001 (58.5%)	489 (35.0%)	<0.0001
More time on my hobbies	2073 (42.5%)	1527 (44.6%)	518 (37.1%)	<0.0001
More time exercising	1111 (22.8%)	780 (22.8%)	320 (22.9%)	0.9367
COVID-19-related community work	592 (12.1%)	500 (14.6%)	83 (5.9%)	<0.0001
Working from home	431 (8.8%)	291 (8.5%)	136 (9.7%)	0.1733
Other	987 (20.2%)	691 (20.2%)	283 (20.3%)	0.9631
Cleaning, home renovations, gardening, organizing/decluttering	308 (6.3%)			
Reading	198 (4.1%)			
Not spending my time differently than before COVID-19	179 (3.7%)	89 (2.6%)	86 (6.2%)	<0.0001
Difficulties experienced [b]				
Getting supplies (e.g. toilet paper, hand sanitizer, cleaning products, bleach, etc.)	2029 (41.6%)	1471 (43.0%)	528 (37.8%)	0.0009
Getting/ordering groceries	1611 (33.0%)	1130 (33.0%)	459 (32.9%)	0.9066
Changes to planned health treatments (e.g. cancer treatment, outpatient procedure, surgery, etc).	1296 (26.6%)	890 (26.0%)	388 (27.8%)	0.2098
Accessing healthcare	1040 (21.3%)	697 (20.4%)	326 (23.3%)	0.0226
Getting prescription medications	687 (14.1%)	448 (13.1%)	230 (16.5%)	0.0023
Other	776 (15.9%)	602 (17.6%)	171 (12.2%)	<0.0001
Prescription, medications on backorder	40 (0.8%)			
No difficulties experienced	1353 (27.7%)	939 (27.5%)	398 (28.5%)	0.4638

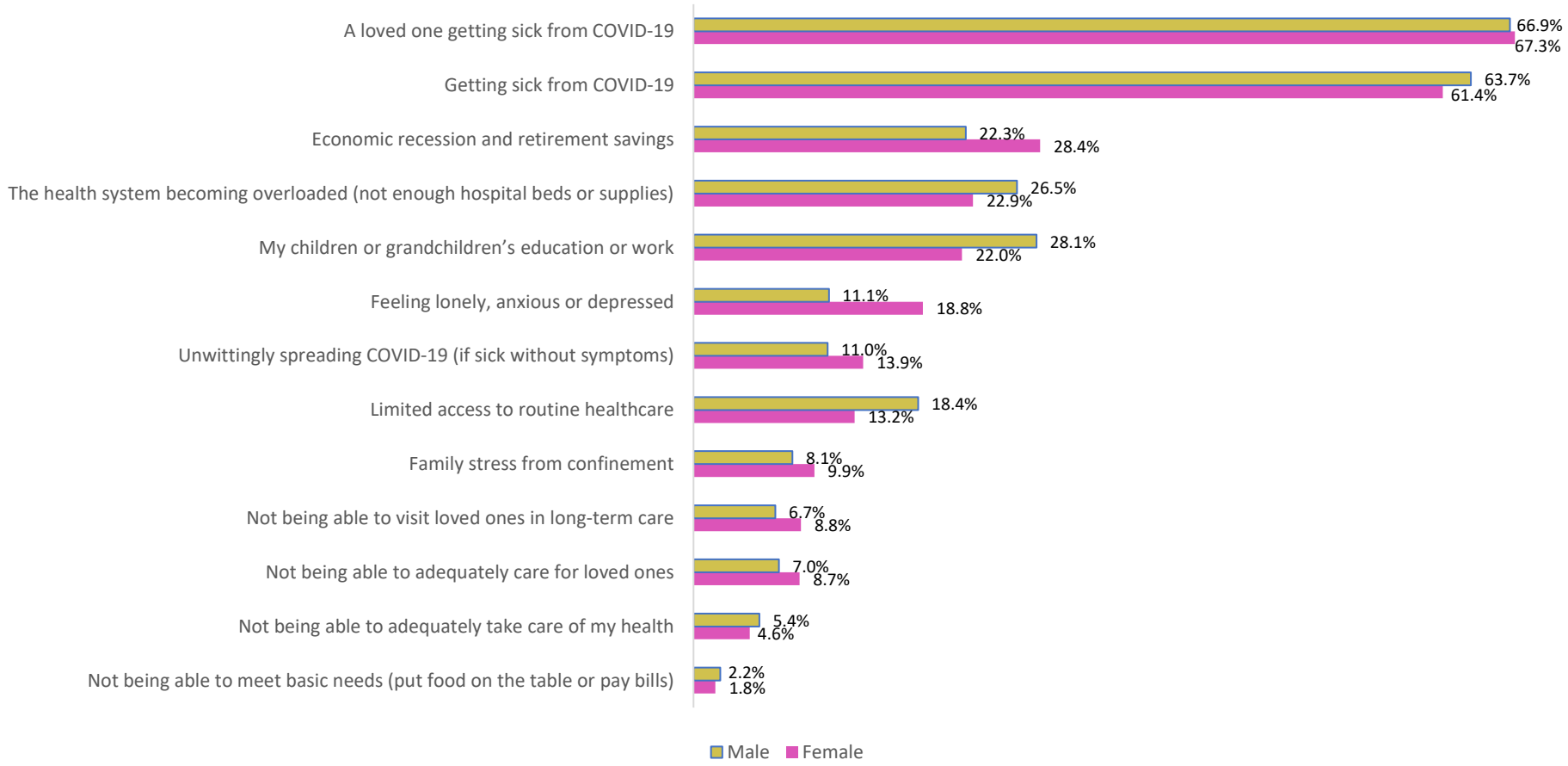
eTable 1. Impact of COVID-19 on daily life reported by a sample of older Canadians, May 2020 (Continued)

	All (N=4,879)[a]	Female (N=3,421)	Male (N=1,397)	P-Value
Positive effects experienced [b]				
Slower pace of life / more time to relax or rest	2583 (52.9%)	1879 (54.9%)	673 (48.2%)	<0.0001
Feeling more connected to partner, family and friends	2062 (42.3%)	1405 (41.1%)	629 (45.0%)	0.0117
A growing respect for older adults and their needs by society	1778 (36.4%)	1279 (37.4%)	473 (33.9%)	0.0209
Stronger sense of community	1571 (32.2%)	1129 (33.0%)	429 (30.7%)	0.1225
No or less time spent commuting to work	341 (7.0%)	240 (7.0%)	96 (6.9%)	0.8590
Improved access to healthcare through virtual care	190 (3.9%)	143 (4.2%)	47 (3.4%)	0.1868
Other	492 (10.1%)	374 (10.9%)	113 (8.1%)	0.0030
None experienced	778 (16.0%)	519 (15.2%)	246 (17.6%)	0.0356

[a] 61 respondents did not identify their gender

[b] categories not mutually exclusive

eFigure 1. Top new or additional concerns related to COVID-19 and physical distancing measures reported by survey respondents, May 2020.



Checklist for Reporting Results of Internet E-Surveys (CHERRIES)

Checklist Item	***Explanation***	***Page Number***
Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	5
IRB approval	Mention whether the study has been approved by an IRB.	6
Informed consent	Describe the informed consent process. Where were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	6
Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	7
Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	6-7
Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only open to a sample which the investigator knows (password-protected survey).	5
Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	5
Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	5
Web/E-mail	State the type of e-survey (eg, one posted on a Web site, or one sent out through e-mail). If it is an e-mail survey, were the responses entered manually into a database, or was there an automatic method for capturing responses?	5
Context	Describe the Web site (for mailing list/newsgroup) in which the survey was posted. What is the Web site about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the Web site could pre-select the sample or influence the results. For example, a survey about vaccination on a anti-immunization Web site will have different results from a Web survey conducted on a government Web site	NA
Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the Web site, or was it a voluntary survey?	6
Incentives	Were any incentives offered (eg, monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	6

Time/Date	In what timeframe were the data collected?	5
Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	NA
Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	7
Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	NA
Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	NA
Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if “yes”, how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as “not applicable” or “rather not say”, and selection of one response option should be enforced.	NA
Review step	State whether respondents were able to review and change their answers (eg, through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	NA
Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	NA
View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	NA
Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or the informed consents page, if present). This can also be called “recruitment” rate.	NA
Completion rate (Ratio of users who finished the survey/users who	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate “informed consent” page or if the survey goes over several pages. This is a measure for attrition. Note that “completion” can involve leaving questionnaire items blank. This is not a measure for how completely	7

agreed to participate)	questionnaires were filled in. (If you need a measure for this, use the word “completeness rate”.)	
Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users access to the survey twice; or were duplicate database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user. If so, mention the period of time for which no two entries from the same IP address were allowed (eg, 24 hours). Were duplicate entries avoided by preventing users with the same IP address access to the survey twice; or were duplicate database entries having the same IP address within a given period of time eliminated before analysis? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	NA
Registration	In “closed” (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done. For example, was the survey never displayed a second time once the user had filled it in, or was the username stored together with the survey results and later eliminated? If the latter, which entries were kept for analysis (eg, the first entry or the most recent)?	NA
Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	8
Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	NA
Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non-representative sample; if so, please describe the methods.	NA